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JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XLI. 1915.

PART I.

TREES OF THE CAMBRIDGE BOTANIC GARDEN.

By R. IRWIN LYNCH, M.A., V.M.H., A.L.S.

[Read February 16, 1915; Mr. J. CHEAL, V.M.H., in the Chair.]

THE Cambridge Botanic Garden was established on its present site in 1846. From sixty-eight to sixty-nine years have now elapsed, and during that time the collection of trees has grown up to form an important feature; some indeed are finer than can be found elsewhere in the British Isles; one or two, I believe, are not surpassed in Europe; and a number of others, some among them planted in comparatively recent years, have attained a development on account of which they attract attention. This, I think, is a good result; it has come about, not through any natural advantage, but in spite of poor soil and dry climate. The soil is light and deficient in clay, permeated with chalk, and stony; it is thus the reverse of retentive, and with free drainage below is liable to be very dry. The subsoil is sandy; below comes a chalky marl, next gravel, and then the blue clay known as gault, which is reached at a depth of 11 or 12 ft. Surface water stopped by the gault may be found from 8 to 12 ft. down, but this does not seem in the least to help the soil above. Rainfall amounts to an average of about 21 inches per annum, but it is the long dry periods, I believe, that are really trying. Shelter is such that wind is always noticeably much stronger on going out into the open country, but easterly winds are certainly felt quite keenly in spring. We are situated on the south side of the town of Cambridge, about the middle of the alluvial plain of the river Cam and its tributaries. The highest part of the garden is 43 ft. above the

level of the sea, the lowest about 34½ ft., and the sea is distant about 56 miles towards the north and about 62 miles towards the east. Climate is of inland character and not at all maritime. Winter temperatures may touch zero, or in exceptional winters there may be no more than 10 or 12 degrees of frost.

References in this paper are limited to the most important trees, and to those most likely to be useful. The descriptive notes are long or short, according to probable utility in each case.

GROUP I.—THE UNIQUE AND THE MOST IMPORTANT.

1. PINUS GERARDIANA Wall. (*Elwes and Henry,** v. 1052). (Fig. 1.)

This is by far the most important tree of its genus in the Garden. It is very much larger than most other examples, but there are two larger, one in the late Lord ARDILAUN'S garden at St. Anne's, near Dublin, which, in 1903, was 25 ft. high; and another at Grafrath, near Munich, which in 1910 was 20 ft. high. The present tree is now 17 ft. 8 in. in height and 14 ft. through. It has grown 3 ft. 6 in. in height during the last four years. It is the only good specimen in England.

It is native of the Western Himalayas, and occurs also in the mountains of Baluchistan, Northern Afghanistan, Kafiristan, and in the Hariab district. The tree is very valuable on account of its edible seeds, which are an article of food in the Himalayas, and are largely imported to the plains of India from the hills of the Punjab and Afghanistan. They have only a slight flavour of turpentine, and are eaten roasted at dessert by Europeans. It is hardly ever felled, but the wood is tough and is used for the hook supporting the passenger's seat on the native rope bridges. It is spoken of by AITCHISON as a very handsome tree, branching more like an Oak than a Pine, and readily distinguished at a distance by its ashy-grey bark, which, on close examination, consists of patches of all tints from light green to red and brown, due to the peculiar way in which it exfoliates. In this feature it is precisely similar to Plane. It is one of the two Plane-bark Pines, the other being *P. Bungeana*. Both are three-leaved Pines. Of *P. Gerardiana* the basal sheaths are deciduous in the second year, of *P. Bungeana* in the first year.

2. PINUS MONTANA var. UNCINATA Willkomm (*Elwes and Henry*, v. 1128; *Gard. Chron.* xxii. (1884), p. 208, fig. 48).

This tree has been of great interest to Professor HENRY. By ELWES and HENRY *P. montana* is treated as a collective species, and they do not appear to point out a type. It includes two tree forms, the present from 30 to 50 ft. high, with another about 30 ft. high; and two dwarf forms, each about 6 ft. high. These are the well-known *P. Pumilio* and *P. Mughus*, both represented in the Garden

* *The Trees of Great Britain and Ireland*, by H. J. ELWES and Dr. A. HENRY, is referred to here and elsewhere by the authors' names.

by good specimens well up to recorded height. This tree form is the only one met with in Spain, in the Eastern and Central Pyrenees, and in the French Alps, and is of rare occurrence in Switzerland. It forms extensive woods in sub-alpine regions up to the timber line. In the Cambridge Botanic Garden its height in 1910 was 41 ft. 6 in., and it is now just over 42 ft. in height.

Interest in this tree is chiefly from the botanical point of view.

3. LARIX DAHURICA var. PENDULA. (Fig. 2.)

This is a remarkable specimen, and I have never heard of any other approaching it. It is grafted at a height of about six feet from the ground on Common Larch and spreads over a considerable area, extending 45 ft. 6 in. in one direction over a pathway, and 33 ft. transversely. In spring and summer the canopy of green is charming and unique; in winter the brown pendulous twigs have quite an attractive appearance.

Of ordinary *L. dahurica* we have a specimen which in 1906 measured 56 ft. in height and 5 ft. in girth. The species is not unlike *L. europaea*, but the twigs are brown instead of yellowish grey, and the tips of the bracts do not project from the cone. It is a native of Saghalien, E. Manchuria, and Siberia.

4. THUYA ORIENTALIS var. PENDULA Masters (*Journ. R. Hort. Soc.* xiv. 252).

The tree here recorded is believed to be the finest in this country. In 1910 it was 23 ft. 6 in. high, and now measures 25 ft. high. It is really the juvenile form of the common *Thuya* or *Biota orientalis* maintained to adult age. Seeds have been raised and they have produced the ordinary *Thuya orientalis*, which is native of North and West China. Messrs. ELWES and HENRY say that "this shrub was first observed by THUNBERG in Japan, and specimens were collected near Yokohama by MAXIMOWICZ. It was also met with by FORTUNE in China, and has been raised in Europe." As an ornamental tree it is quite distinct, and grows as freely as the type. It was long regarded as specifically distinct.

5. EPHEDRA NEBRODENSIS var. PROCERA Stapf (*Die Arten der Gattung Ephedra*, p. 80).

A native of Persia, Caucasus, Armenia, Asia Minor, and Greece, this is not really a tree, but rather a shrub, though not at all like any ordinary shrub. It is a "switch plant," consisting only of slender green stems without leaves. The present is quite the finest of any *Ephedra*, I believe, in the British Isles. It measures 21 ft. through, and 7 ft. 8 in. in height. It extends by sending up shoots from the ground, and in this way it has increased at the rate of about 18 in. in four years. *Ephedra* is one of the three genera of Gnetaceae, the other two being *Gnetum*, from which the order derives its name, and *Welwitschia*, one of the great wonders of vegetation.

6. Quercus obtusata Humboldt and Bonpland (*Elwes and Henry*, v. 1312). (Fig. 5.)

This is one of the most important specimens in the Cambridge Botanic Garden. It is a fine, handsome tree, the largest known in cultivation—indeed the only one known of any size. It was 39 ft. high and 35 ft. through in 1910, and is now 42½ ft. high and 38 ft. through. It is a native of Mexico, and widely spread in the mountains of the south, where it forms a large tree. It was discovered by Humboldt near Ario at an elevation of 6000 ft. The wood is very compact and strong, taking a fine polish. In general appearance this tree is not very unlike the common pedunculate Oak, but the leaves are sub-evergreen and are retained until about March. The leaves, like those of *Q. pedunculata*, are quite glabrous beneath and are auricled at the base; but besides the sub-evergreen character there is the difference of a longer petiole, more (instead of usually less) than ½ in. long. It is a good tree for the landscape, the bright green leaves being valuable in effect when other trees are bare.

7. Asimina triloba Dun. Monog. Anon (*Bot. Mag.* t. 5854). (Figs. 3, 4.)

This is one of the most interesting of the trees in the Cambridge Botanic Garden, and the finest example known in Great Britain. It is 15 ft. 4 in. in height, having gained 14 in. in four years, and is 20½ through, a gain of 4 ft. in four years. It is the only species of the order Anonaceae, usually a Tropical Natural Order, that is known to be hardy in this country. It is the Custard Apple or Papaw of the Middle, Western, and Southern United States of America, and is allied to the Cherimoya of Peru, the Custard Apple and the Soursop of the West Indies. The fruit is fragrant and edible; it varies in quality, but selections well worth eating can be made. It is yellow in colour. The tree grows from 15 to 30 ft. high, and is found on the banks of streams. This latter fact explains in great measure the fineness of the Cambridge specimen. It is growing within a few feet of the pond, and has a stream of water on the side away from it. The tree was introduced by Peter Colinson in 1756.

8. Acer creticum Linn.

This species of Maple is one of the smallest, and is distinct in its nearly evergreen character and the slight lobing of its small coriaceous leaves. The tree in 1910 was 16 ft. high and 14 ft. 6 in. through; it is now 17 ft. 6 in. high and 17ft. 6 in. through. At Syon House some time ago there was a large tree not in good health. In the Jardin des Plantes, Paris, according to Lindley, a tree 130 years planted was 31 ft. high; and a tree at Wörlitz 55 years planted was 40 ft. high. The Cambridge tree flowers freely, and good seeds have sometimes been produced, from which seedlings have been raised. It is a native of Greece, Crete, and Lycia, and was introduced in 1752. According to a synopsis of the Maples in cultivation by Elwes and Henry, this species is the only one with trilobed leaves minutely crenulated. Its

FIG. 1.—PINUS GERARDIANA, CAMBRIDGE BOTANIC GARDEN.

[To face p. 4

Fig. 2.—Larix dahurica pendula, in Cambridge Botanic Garden (Nov. 1913).

FIG. 3. ASIMINA TRILOBA, CAMBRIDGE BOTANIC GARDEN.

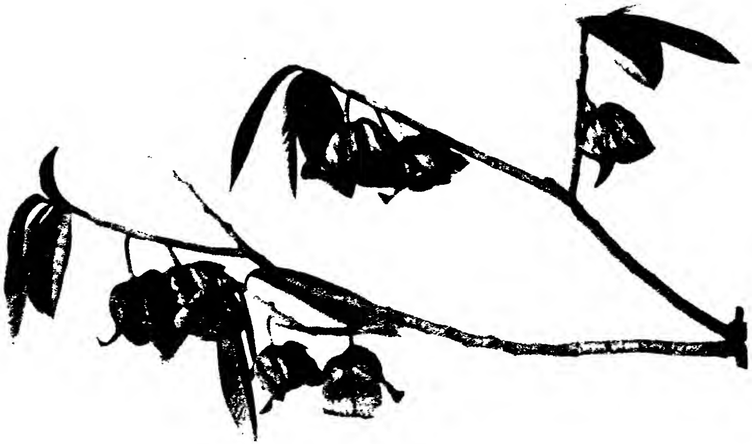

FIG. 4. ASIMINA TRILOBA FLOWERS

nearest ally, perhaps, is *A. monspessulanum*, with entire margins, of which also there is a good specimen in the Garden. The fruit is small, glabrous, with parallel wings.

9. CERCIS SILIQUASTRUM Willd. (*Bot. Mag.*, t. 1138). The Judas Tree.

The tree in the Cambridge Botanic Garden, so far as I have been able to discover, is the finest in this country. It measured 27 ft. 6 in. in height by 51 ft. in width in 1910, and is now no higher, but much greater in width owing to the falling apart of some of the heavier branches. In May it constitutes one of the sights to be seen in this garden. It is a native of the south of Europe and was cultivated by GERARD in 1596. The wood is hard, beautifully veined, and takes a high polish. The flowers are said, from their sweetish acid taste, to form an agreeable addition to salads. They are pink, or rosy pink, in colour; but there is a white variety which is exceedingly beautiful. At Cambridge also we have the Canadian species, *C. canadensis*, known as "Redbud," which apparently does not flower at all freely.

10. PTEROCARYA CAUCASICA C. A. Meyer (*Elwes and Henry*, ii. 438).

The mass of this tree to which I draw your attention is one of the most striking ornaments out of doors in the Cambridge Botanic Garden. Originally there were two trees; one of them blew down about 29 years ago, and from the roots there sprang up a thicket of growth which consists now of quite respectable trees equalling the original remaining one in height. Growth has been strong and rapid, and this has been due, no doubt, to a small stream almost, now, in the middle of the thicket. The roots invade this stream and would soon stop it up if they were not cut out from time to time. It fruits freely, and in July the catkins of fruit have a quite ornamental effect. The old tree in 1903 was 58 ft. high, in 1910 it was 61 ft. high. The finest tree known is at Melbury, Dorsetshire, the seat of the Earl of ILCHESTER. When measured it was 90 ft. high, 11ft. in girth, with bole 15ft. long. There is also a fine tree at Claremont Park, near Esher. It is a native of Persia and the Caucasus.

11. SOPHORA JAPONICA Linn. (Fig. 6.)

The finest tree, with one exception, of which dimensions are recorded, is standing on the site of the old Botanic Garden, now largely covered by Museum Buildings. In 1904 the tree measured 73 ft. high and the bole 11 ft. in girth. A tree which perhaps exceeds this in size is mentioned in a footnote by ELWES and HENRY as growing at Cobham Park in Kent. At Kew in 1903 a tree near the Pagoda measured 68 ft. in height and the bole 8 ft. 3 in. in circumference. Some years ago there was a fine tree on a slight elevation near the present Tropical Orchid House, and there was formerly a tree on the front wall of Descanso House by the Richmond Road, near the Green. It is wild in the Province of Chihli in China, but it is not native of Japan. The buds, it is stated, are used for dyeing yellow, and all parts of the

tree contain an active principle allied to the cathartine found in leaves of Senna, and it is said that the wood cannot be worked for this reason when fresh. There is a well under a tree in the Botanic Garden at Dijon which is covered up at certain seasons in order that the water may not be made medicinal by the flowers and leaves that would otherwise fall into it. The pods are used in native medicine. The old Botanic Garden was established in 1761; in NICHOLSON'S *Dictionary* the date of introduction is given as 1763; but DON, in his *Hortus Cantabrigiensis*, gives 1753. This tree, however, is probably younger than the 153 years possible on the site. The trunk of this tree is very fine and symmetrical.

12. BERBERIS FREMONTI Torr., *in Bot. Mex. Boundary, N.W. America (Texas, Arizona, &c.).*

This is a remarkably distinct Berberis. It is of shrubby, spreading habit, with glaucous, pinnate leaves. The subject of this note is 8 ft. high and 8 ft. wide, growing against the east side of one of the plant-houses, where it is sheltered from the east and from the north. From all information given me it must be the finest specimen in this country. It has never flowered. In summer it is quite remarkable from the glaucous blue tint of the leaves. Another glaucous-leaved Barberry, native of New Mexico, is *B. trifoliata*, but the leaves are trifoliolate and not pinnate.

13. ROSA MACROPHYLLA Lindl. (*Ros. Mon.* p. 35, t. 6).

This is a very fine Rose, native of the Himalayas and China, nearly always in flower, and the largest, not a climber, in the Cambridge Botanic Garden. It belongs to Lindley's Division, the Cinnamomeae, and is well marked by its spineless character and very long, narrow sepals, which are longer than the petals. The present tree in 1910 was 16 ft. 9 in. high and 24 ft. 2 in. through. It is now 18½ ft. high and 25½ ft. through. The leaves are described as very long and are so figured, but this is not always a feature of the living plant. It is included here on account of its being 10 ft. in excess of the height given for this Rose.

14. ROSA MOSCHATA Herrm. *Diss.* 15. (Fig. 7.)

R. Brunonii *Lindl.* (*Ros. Mon.* 120, t. 14; *Bot. Mag.* t. 4030).

For many years this has been a feature in the Cambridge Botanic Garden, climbing to the top of a *Pinus austriaca*, and attaining 48 ft. in height, with a diameter of 38 ft. Flowering in June, it is most lovely; the flowers are pure white and extraordinarily profuse. It is one of the finest of climbing Roses, but makes a very good shrub in a large bed. It is a native of Europe and extends to India.

15. XANTHOCERAS SORBIFOLIA Bunge (*Bot. Mag.* t. 6923).

In the *Botanical Magazine* this is described as "one of the most attractive and interesting hardy garden shrubs that has been introduced for many years." The figure is a fine one and was chiefly

made from material sent from Cambridge, apple-shaped fruit being illustrated from Paris specimens, and pyriform fruit from M. J. VAN VOLXEM of Brussels. The tree was introduced to the Paris garden by Father DAVID about 1867. I saw it there against a wall in that very hot walled depression where many good things have been grown, and this, I dare say, suggested to me its present position at Cambridge, and certainly it does justify the wall of my house, though it is said to be hardy.* The leaves are pinnate, light green, and the flowers, 1½ in. across, are white with rosy centres. It is native of North China, and the seeds are eaten by the Chinese. They ripen here, and have sometimes germinated where they fell. This specimen is 27 ft. 3 in. high.

16. HIPPOPHAË SALICIFOLIA Don.

This is a graceful and ornamental Himalayan tree. It has been referred to *Hippophaë rhamnoides* as a variety under the name *angustifolia*, but it grows much taller and is very different in appearance, being more graceful and its leaves less silvery. The Cambridge tree has been a very fine one, and, though it has now lost a considerable branch, it still remains beautiful. In 1910 it was 42 ft. 10 in. high, and 34 ft. through. Its height, four years after, is now 46 ft., 6 ft. higher than the best record I find for it. It is one of those trees that one regrets never to see planted.

GROUP II.—TREES OF SPECIAL INTEREST, INCLUDING SOME FINE EXAMPLES.

17. PINUS MONOPHYLLA Torrey (*Elwes and Henry*, v. 1056). The One-leaved Nut Pine. (Fig. 8.)

Though planted well within the last twenty years, I find that this tree is looked upon as a good specimen. It grows in a very dry climate, and is therefore perhaps better suited in this district than in some others. In 1911 it measured 7 ft. high, and in 1914 it was 9 ft. high. It is said to grow too slowly to be of use in a garden, but this tree is thus increasing at the rate of 8 inches per annum.

The best specimen known in this country is at Dunburgh House, Beccles; it is about 14 ft. high and bore a cone in 1908. Another in Paul's Nursery, Cheshunt, was 13 ft. high in 1909. It is a handsome tree, and is of some economic importance, the seeds forming an important article of food of the Indians of Nevada and California; they are highly esteemed by the white people, who eat them roasted. They are ⅝ in. long and ½ in. wide. The timber is used for firewood, and is largely used in the mines. This species is easily distinguished by its monophyllous character. According to Dr. MASTERS, the monophyllous character is due to the arrested development in the bud of one leaf of a two-leaved cluster. The single leaf is perfectly round and is like a very stout sewing needle. Occasionally the second leaf is developed and a two-leaved cluster results. These two leaves

* [It is perfectly hardy at Wisley. ED.]

may adhere to form one round needle, but the fact of two leaves is demonstrated by the two vascular bundles, evident on making a section. The primary flattened leaves are the only leaves on the seedlings till they are about five years old; they then become shorter, buds form on their axils and produce the adult leaves. This tree is silvery and, I think, distinctly ornamental.

18. JUNIPERUS EXCELSA Bieb. (*Elwes and Henry*, vi. 1446).

Our specimen of this well-known Juniper is one of the several fine examples placed on record by ELWES and HENRY. It is now 32 ft. high, and might no doubt be higher but for its unfortunate proximity to an overhanging Cedar of Lebanon. At Arley Castle there was a tree said to have been planted in 1877, 32 ft. high in 1904. Another at High Canon, Herts, was 32 ft. high in 1904. In Asia Minor the tree occasionally attains a height of from 70 to 100 ft. It there forms extensive woods, either pure or mixed with Lebanon Cedar and *Abies cilicica*. SIHE considers that the timber will prove of great value for railway sleepers. In the Crimea it is common on the coast side of the mountains forming pure woods of considerable extent, but never attaining a large size, the tallest tree noted being about 30 ft. high. As a garden tree this is one of the best of the Junipers, though sombre in effect.

19. PRUMNOPITYS ELEGANS Philippi; the Plum-fruited Yew.
Podocarpus andina *Poeppig.*

Native of the Andes of Southern Chile. In general appearance this Prumnopitys is not unlike a Yew, but it is less stiff and more graceful. It is described as easy to distinguish because the bud-scales are valvate instead of imbricate. This tree is diœcious according to VEITCH'S "Manual of the Coniferae." In this work the fruit and a fruiting branchlet are illustrated from specimens produced at Eastnor Castle. The fruit is said to be about the size of the wild Damson or Bullace (*Prunus insititia*) and of the same shape and colour. It was introduced from Valdivia by the Messrs. VEITCH in 1860. It is hardy over the greater part of Britain, growing most freely in the south-western counties of England and in Ireland. It grows freely in Cambridge and has never been injured, but protection has been afforded in very severe winters. The height of this specimen is 11 ft. and its diameter 13 ft. It is a very handsome small tree for a lawn.

20. TILIA PETIOLARIS J. D. Hooker (*Bot. Mag.* t. 6737; *Elwes and Henry*, vii. 1677).

In ELWES and HENRY this tree is referred to as a fine specimen. It is certainly a very handsome one. In 1910 it was 62 ft. high, and it is now about 63½ ft. high. Several fine trees are recorded, but the finest, I believe, is one on the lawn at Burton, Suffolk, 83 ft. high by 8 ft. 2 in. in 1908. At Herrenhausen there is a tree 9 ft. 2 in. in girth in 1908. *Tilia petiolaris* is unknown in a wild state, though SCHNEIDER believes it to be native of Southern Hungary and the Balkan States.

FIG. 5. QUERCUS OBTUSATA.

[To face p. 8.

FIG. 6.—SOPHORA JAPONICA

FIG. 7. ROSA MOSCHATA, GROWING OVER PINUS AUSTRIACA.

FIG. 8.—PINUS MONOPHYLLA

[To face p. 9.

ELWES and HENRY believe it to be a sport of *T. tomentosa*; the branchlets, buds, and flowers are identical with those of that species. The petioles, however, are longer, and the fact that bees are killed by the flowers appears to indicate a certain amount of essential difference. Whatever the origin of the tree, it is one that should be planted in every garden that is not too small for it.

21. GARRYA ELLIPTICA Dougl. (*Botanical Register*, t. 1686).

Both interesting and ornamental, this N.-W. American shrub is found in most gardens, especially those in the milder parts of the country. Cambridge has no claim to mild climate, but I know no finer specimen than ours. It measured, four years ago, 29 ft. by 18 ft. and over 11 ft. high. It is now 12 ft. high and 31 ft. wide. It is the male plant that is most ornamental and best known, but the flowers of the female plant are also on catkins. It was discovered by one of the Society's collectors, the well-known DAVID DOUGLAS, whose Journal has recently been published under the editorship of our Secretary, and it was described as the greatest curiosity in his collections. We now know that it really belongs to the Family Cornaceae, but it was said to differ essentially from any known order and to constitute the commencement of a new group. It was upon this species that the genus was founded, and though we are not now in difficulty as to its position it is still of great interest on account of its male and female catkins, which are anomalous in the Family. It grafts on *Cornus*, and this fact was formerly mentioned to show that a plant of one Family could be grafted on another.

22. PAULOWNIA TOMENTOSA Koch (*Elwes and Henry*, vi. 1493).

Although not one of the largest examples, this tree is one to be proud of. It is now 23 ft. 4 in. high, with a diameter of 28½ ft., and is sometimes very fine in flower, never failing to flower tolerably well. The finest tree in Europe is probably an original one in the Jardin des Plantes, Paris, which, in 1904, was about 60 ft. high and 12 ft. in girth. The largest tree in England is believed to be one standing near the entrance lodge at Westonbirt, Gloucestershire, which, in 1911, was 56 ft. high by 7 ft. at 3 ft. from the ground. The wood of Paulownia has a beautiful grain and is preferred of all others for wardrobes on account of its resistance to damp. The well-known name *Paulownia imperialis* (Siebold and Zuccarini, *Fl. Jap.* i. 27 (1835)) for this tree is not the earliest; in 1784 it was named *Bignonia tomentosa* by THUNBERG in his *Flora of Japan*, and KOCH in his *Dendrologie*, ii. Pt. 1, p. 299 (1872), placed it in its earliest correct genus with its earliest specific name. It is one of the very few trees of the order Scrophulariaceae. It has the peculiarity of forming its flower buds which open in the following June before the leaves fall in autumn.

23. DRIMYS WINTERI Forst. (*Bot. Mag.* t. 4800).

Under the name of Winter's Bark this tree once possessed some celebrity. The use of its bark medicinally as a tonic was brought

to notice by Captain WINTER, who accompanied Sir FRANCIS DRAKE in the year 1578 to the Straits of Magellan, where it was first discovered. Usually the plant must be grown in a greenhouse or at least under very favourable conditions out of doors, except in the West of England and in Ireland. Here it is planted against the east side of the palm-house, where it has attracted a good deal of attention. It is not showy, but it has some claims to beauty; indeed it has been spoken of as one of the finest things in the garden. The flowers are of pale yellowish-green white. It belongs to the Magnoliaceae. This specimen is 10 ft. 6 in. high and 9 ft. 3 in. through.

24. EUCALYPTUS GUNNII Hk. F. (*Elwes and Henry*, vi. 1639; *Bot. Mag.* t. 7808*). Cider Tree or Swamp Gum.

There are a number of larger trees than this, but there is always interest where history can be recorded. This tree was received from Messrs. DICKSONS, of Chester, in 1898; in 1911 it was 29 ft. high, and it is now 35½ ft. high.

A remarkable plantation of this Eucalyptus was made by the late JOHN BATEMAN, Esq., of Brightlingsea Hall, Essex, of plants raised from seed received in 1887 from Mr. SHENMAN in Southern Argentine, who had there naturalized this Tasmanian *E. Gunnii*. The trees are mentioned as 50 ft. high, with a girth of 3–4 ft., quite unimpaired by wind or frost even with so low a temperature as 5° Fahr. There are now many trees planted about the country, and in a few years there should be some interesting reports. In Tasmania the tree is almost confined to exposed moorland at an altitude of 2,000 ft., and will not live at low elevations. It is native also of Victoria and New South Wales. The wood is of little value in Tasmania because of its small size.

25. CITRUS TRIFOLIATA L.

I do not draw attention to this tree as one of the finest. It is only a good example of a very interesting and perhaps important small tree. It is beautiful in its profusion of white flowers in spring, and perhaps important as a parent with the common Orange in producing a fruit tree for the Southern United States, where the common Orange itself is too frequently destroyed by frost. It is interesting to me because it explains very clearly the nature of the leaf of the common Orange. The leaf is trifoliolate, and as the stalk of the orange leaf is jointed it seems to show that at this point two lateral leaflets are wanting. The Cambridge specimen, unfortunately, grows where it must be restricted. In 1911 it was 9½ ft. high and 13½ ft. wide. It is now, after unavoidable cutting back, 9 ft. high and 12 ft. wide. Growing here it seems to show the value of a little protection. A few feet from where it is now is a border upon which it refused to make any progress; when planted against a plant-house it immediately made rapid progress. It is a native of Japan, and it is there used as a garden plant and for fences.

* The plant figured in the *Botanical Magazine* is called var. *montana*, but MAIDEN points out that it differs in no way from the type.

26. Betula papyrifera Marshall (*Elwes and Henry*, iv. 985, pl. 269, fig. 5).

This tree, though not the finest in cultivation, is sufficiently fine to be mentioned by Elwes and Henry in their great work. It is said to have been 47 ft. high in 1906, with a girth of 4ft. 7 in.; in 1910 it was 47 ft. 6 in. high; and in 1914 52 ft. 9 in. high and 43 ft. 6 in. through.

It is a grafted tree. The finest tree of which we have record is that in Mr. Kaufman's garden at White Knights, near Reading, which, in 1914, measured 82 ft. high by 4 ft. 11 in. in girth. In America, in its typical form, it attains a height of 60 or 70 ft. It spreads over a vast territory in North America, and is very variable. On the alluvial banks of the Fraser River it attains a height of from 100 to 120 ft. As an ornamental tree in this country it is distinct, but not more beautiful than the common Silver Birch. I have found no information as to the value of the timber. The bark is used for making canoes, drinking-utensils, and for roofing.

27. Ailanthus glandulosa Desf. (*Elwes and Henry*, i. 30). Tree of Heaven. (Fig. 9.)

This is one of the fine trees of the Cambridge Botanic Garden, but probably it is in no way remarkable. There is, however, in Cambridge, a remarkable tree, that in the private garden of Trinity College Lodge, planted by Mrs. Hinchcliffe in 1768, one of the tiees raised from the seed first sent to this country by Father d'Incarville. This tree in 1911 was 59½ ft. high and 49 ft. through. It is now 60 ft. high and 51 ft. through. The largest tree on record was at Syon House, 100 ft. high in 1880, but now dead. The largest tree now in England is at Belton Bark, the seat of Earl Brownlow, 83 ft. high and 6 ft. in girth. At Kew there is a tree behind the Palace 73 ft. high and 8 ft. in girth. There is scarcely any more noble tree known, at any rate for foliage. The leaves can attain a length of 4 ft. and a width of 15 in. By cutting down a tree or by growing a single shoot, enormous developments are easily obtained. The wood, used only for firewood, is said to resemble that of the Ash in structure, but it is certainly very brittle; by its distinct bark it can easily be recognized. The Silk Moth, *Attacus cynthia* Drury, feeds upon the leaves of this tree. It was introduced to France, but all were killed in the winter of 1879. The tree itself is perfectly hardy, and it is one of the most select for planting in public places for shade. It is native of Northern China.

28. Crataegus tanacetifolia Pers. (*Syn.* ii. 38). (Fig. 10.)

A tree of this very distinct Levantine Thorn, 25 ft. high four years ago, and still of the same height, has been considered a fine specimen, and attention may therefore be drawn to it. It has ceased to increase in height because all the points of growth have become spurs producing flowers and fruit. Few species are more distinct. It forms a robust tree, with upright, rigid branches. The leaves are pinnatifidly cut, and

covered on both sides with long hairs. The fruit is conspicuous and ornamental, yellowish green when ripe, and easily distinguished by the bracts which usually adhere to it. It is of large size for the genus, about an inch in diameter, and is said to be much eaten by the Armenians. A variety *glabra* we have is very similar in the outline of the leaf, but there are no hairs, and the fruit is red and without the bracts. It is probably a hybrid.

29. JUGLANS NIGRA L. (*Elwes and Henry*, ii. 262). Black Walnut.

This is a very handsome tree, but the value of its wood alone makes it important. The specimen tree of the Cambridge Botanic Garden is 54 ft. 7 in. high, 54 ft. through, and 6 ft. 3 in. in girth four feet from the ground. It was probably planted about 1846, when the Botanic Garden was established on this site. Here it is growing in a somewhat sheltered position, but the soil is certainly not favourable for good growth. The finest tree known is growing in the London County Council Park of Marble Hill, Twickenham, in rich alluvial soil, close to the Thames. In 1905 it measured 98 ft. in height, the stem girthing 14 ft. 3 in. at 5 ft. up. It transplants badly on account of its long, fleshy tap-roots, and should be sown where it is desired to grow it if possible; but Mr. ELWES recommends, for localities liable to late spring frosts, that seeds should be sown in boxes at least 2 ft. deep, the seedlings being planted out when a year old. "As this tree requires to be well sheltered and drawn up by surrounding trees in order to form a tall and valuable trunk, it should be sown or planted in small, deeply-dug patches in a rich wood, kept free from weeds and protected from mice, rabbits, and boys, until the trees are 6 or 8 ft. in height, which they should be under favourable circumstances at four or six years after sowing." The seeds grow easily, and it is recommended that they should be obtained from Canada or New England, as likely to produce stronger plants than the seeds produced by English-grown trees. In Germany Black Walnut thrives only on deep, moist, rich soils, and is said to have succeeded only on the best Oak lands. SCHWAPPACH advocates close planting with Beech and Hornbeam as nurses. It has been extremely successful near Strassburg. With regard to the value of the timber, Mr. ELWES says that though he has been unable to obtain proof of BOULGER's statement as to its freedom from insect attack, the furniture he has had made from English-grown trees is distinctly superior to that of common Walnut, and is as good as imported Black Walnut in colour. In nature the tree can attain a height of 150 ft., and logs 12 ft. long, with a diameter of 52 in., have been obtained.

30. CEDRELA SINENSIS A. Juss. (*Elwes and Henry*, ii. 433).

There is not much reason, probably, for including this tree, since much finer ones are to be found in France, but it is interesting. This specimen is 35½ ft. high and 32 ft. through. The original tree, introduced to the Jardin des Plantes, Paris, by SIMON in 1862, was 40 ft. high in 1891. It was first described by Carrière as *Ailanthus flavescens*,

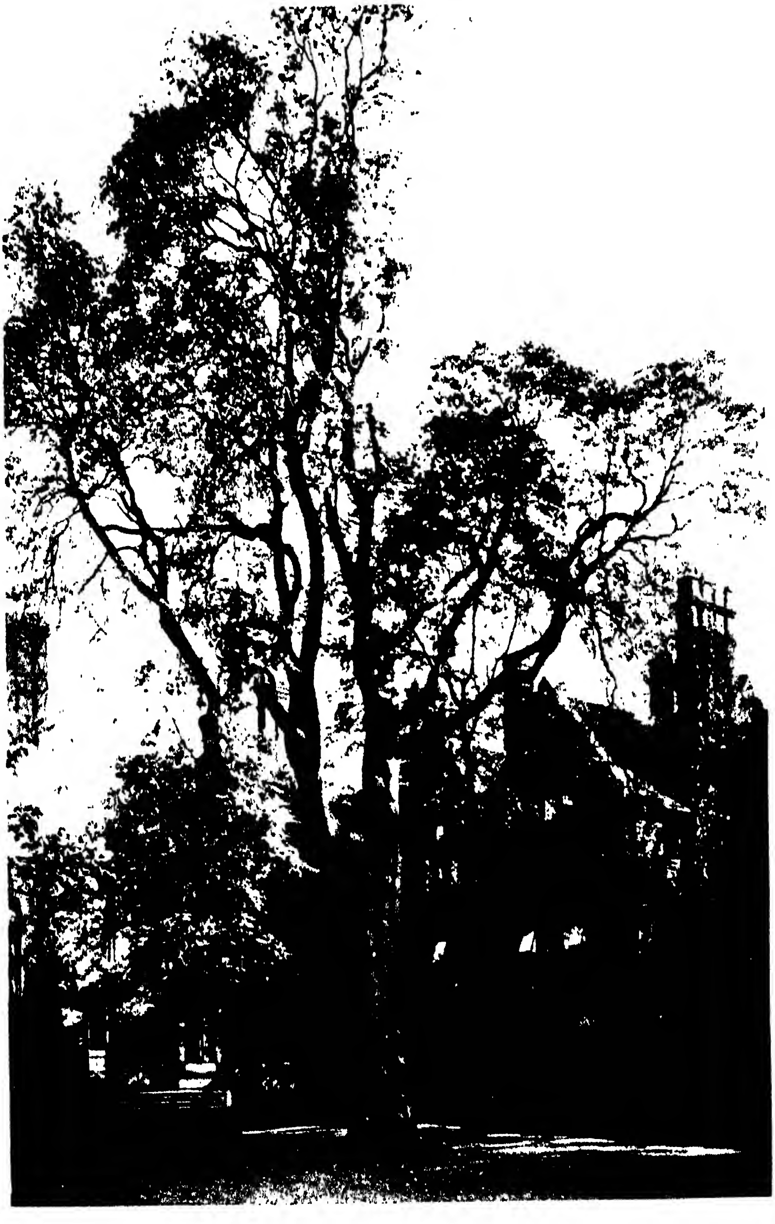

FIG. 9.—AILANTHUS GLANDULOSA, IN THE GARDEN OF THE MASTER OF TRINITY.

[To face p. 12.

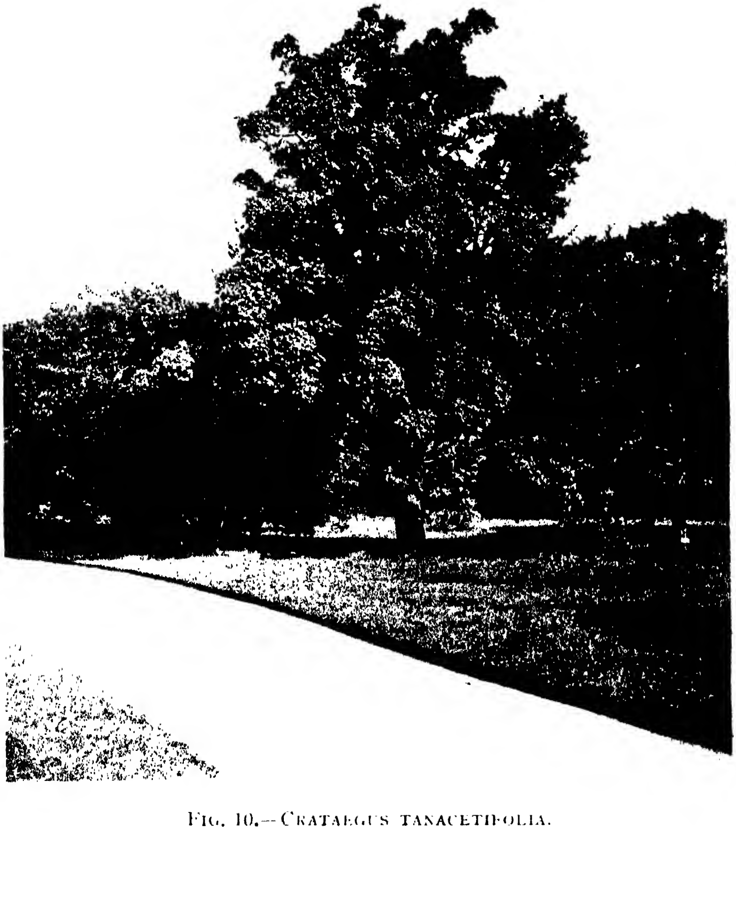

Fig. 10.—Crataegus tanacetifolia.

FIG. 11.—ULMUS NITENS, IN CAMBRIDGE BOTANIC GARDEN.

FIG. 12. ULMUS NITENS, VAR. SOWERBYI, CHRIST'S PIECE, CAMBRIDGE.

[To face p. 13.

and under that name the tree became known, but when it flowered in 1875 it was at once recognized as *Cedrela sinensis*. It appears to be rare in England; in Holland it is largely used for planting in towns, and on account of its moderate growth and fragrant foliage it is perhaps very suitable. Its flowering has not yet been recorded in Britain, and it is said never to have fruited in France, but I have some fruit myself, given me from a tree in a nursery at Orleans where it was freely fruiting in 1911. It is native of Northern and Western China. It is commonly cultivated in Central China, but never attains a great size because the young shoots are much esteemed for food in spring, chopped up and fried in oil. The timber is good, of reddish colour, and often used for making furniture. It belongs to the Meliaceae, to which the Mahogany tree belongs.

31. ACER GINNALA Maxim.

There may be many finer examples of this native of China, Manchuria, and Japan, but this note may usefully draw attention to one of the prettiest of the genus. Though sometimes referred to as a variety of *A. tataricum*, it is much more graceful in habit, and the leaves are more prettily cut and lobed. It has the advantage of doing well where the Japanese Maples cannot succeed on account, I suppose, of lime in the soil. The height of this specimen is 14 ft. 6 in., and its spread rather more than 20 ft. It is described as a small tree or large shrub. In autumn the leaves are brilliant in colour, and there is nothing finer for autumn tints.

32. KOELREUTERIA PANICULATA Laxmann (*Elwes and Henry*, vii. 1932).

Here is a tree of which I know the history. It was planted when about 4 ft. high in 1881. In 1911 it was 29 ft. high and 33½ ft. through. It is now 30 ft. high.

As an ornamental tree it is handsome and symmetrical for a good many years, but from what I have seen I would say that it is very liable to lose parts and to become shapeless. In the Chelsea Botanic Garden some years ago there was a tree rather suggestive of this quality. It is perfectly hardy, however, and the foliage is very handsome. In flower the tree is quite showy with small yellow flowers produced about midsummer. This year the tree at Cambridge is not flowering. It sometimes seeds freely, and, as elsewhere, the seeds germinate where they fall. The finest specimen in England is probably one in Waterer's Nursery at Knaphill, Woking, which was 40 ft. high with a girth of 6 ft. in 1911. There is a fine tree on the upper north terrace of Windsor Castle. It is native of Northern China and is common about Pekin.

33. PYRUS SORBUS Gaertner (*Elwes and Henry*, i. 146).

This is the true Service tree. It is not a native of Britain, though claim for it as a native was long made. Our tree in 1906 was 42 ft. high and 3 ft. 4 in. in girth. It is now distinctly on the decline, but

MOUILLEFERT says that it may live to be from 500 to 600 years old. The fruit naturally varies in quality, just as the Apple or Pear, but some at least are superior to the Medlars. There are two varieties, differing in the shape of the fruit, *maliformis* and *pyriformis*; the former is said not to exceed 30 ft. in height, while the latter grows at least to 70 ft. in height.

34. PYRUS ARIA Sm. White Beam.

The height of this tree is given as from 4 to 40 or 45 ft. This specimen is 43 ft. high, and, being perfectly symmetrical, its inclusion here is no doubt justified. It is said that no tree is more characteristic of the chalk hills of Britain, or more beautiful with regard to fruit and foliage. The tree is very effective in a breeze when the wind lifts the leaves and the white under-surface is displayed. It is a native of Europe (including Britain), N. Africa, and N. and W. Asia.

35. PRUNUS PENDULA Maxim (*Bot. Mag.* t. 8034).

This is perhaps the most graceful of all cultivated Cherries. The branches are long and slender, and consequently pendulous. Dr. STAPF, in the *Botanical Magazine*, says that it is probably a state merely with pendulous branches of a species with normally erect branches; but this remark is preceded by the statement that, according to MAXIMOWICZ, it has been found in a wild state in the mountain forests of Central Japan. In any case, whether a wild or cultivated tree only, it is a very graceful one, and here, planted on a bank, shows off extremely well. The Cherries I have found to do well on a dry bank, and hence the position of this tree. It is commonly cultivated in gardens and near temples in Japan. The flowers vary in depth of colour, ranging from palest pink to saturated rose colour. I have never seen fruit, and I think therefore that it may be self-sterile. This specimen is 11 ft. high, with a spread of 23 ft. It is a very good one.

36. RHUS OSBECKII Carr (*Revue Horticole*, 1887). China and Japan.

This is one of the most ornamental of the Sumachs. It is also very distinct, and though this is a fine specimen there are probably many finer. Three years ago it was 15½ ft. high. It is now 16½ ft. high and 22½ ft. through. The leaves are pinnate, up to 15 in. long, and the stalk is winged, which serves to distinguish it from all other hardy species, except *R. copallina*, which has smaller entire leaflets. The leaflets of *R. Osbeckii* are serrated. It is for foliage alone that this tree would be grown, but it produces large panicles of yellowish-white flowers in August. The leaves are conspicuously red in autumn.

37. PHELLODENDRON JAPONICUM Maximowicz.

This native of China and Japan has been grown as *P. amurense*, but the above I believe to be its correct name. The genus is a small one inhabiting the North-East of Asia. The leaves of this species are pinnate, from 10 to 15 in. long, and very downy beneath. It is recorded as from 20 to 35 ft. high. This tree is 21 ft. high, and during

the last three years has not increased in height, but during this time it has increased from 27 to 36½ ft. in diameter.

38. Fendlera rupicola Engelmann.

I am tempted to have a note on this plant because apparently it is regarded as doing well only on the Continent. Here it does perfectly and is most beautiful, producing wreaths of white flowers nearly, if not quite, 1½ in. in diameter. It is growing on the south side of the Cactus-house and is over 7 ft. high ; its recorded height, presumably wild, being from 3 to 6 ft. Its habit is upright, but its width is nearly 4 ft. No doubt it is one of the best of subjects for a hot sunny position, where it does succeed. It is one of the shrubby Saxifragàceæ, most resembling *Philadelphus*, and is a native of the South-Western United States.

39. Populus serotina Hartig. Black Italian Poplar.

This is the commonest Poplar in the British Isles and one of the two tallest trees, the other being *Ulmus campestris*, the English Elm. It is a hybrid between the American *P. deltoides* and the European *P. nigra*. It is always a staminate tree, and is propagated by cuttings. One of the most interesting trees in the collection is the true *P. deltoides*, one of its parents. *P. canadensis*, believed to originate from the same cross, is always female.

40. Populus nigra var. viridis Lindley (*Syn.* 238 (1829) ; *Camb. Brit. Flora*, ii. p. 10).

This is an extremely interesting tree found in Jersey, Suffolk, Norfolk, and Cambridgeshire. The leaves are broader at the base than are other varieties, and the green is of deeper hue.

41. Populus italica Moench.

This is the well-known Lombardy Poplar, usually referred as a variety to *P. nigra*. Some authorities dissent from this determination, and Dr. Moss considers that differences are infinite in number. Only the pistillate tree is cultivated. It is regarded as possibly a native of Eastern Europe or North-West Asia, and travellers may be asked to observe on the question. Ascherson and Graebner believe it to be native of Eastern Europe. From the habit of the tree I should expect that it is nowhere wild, but I quite agree that it is a fastigiate form of something that is not common *P. nigra*.

Group III.—Elms, in the Botanic Garden and Outside.

Elms flourish in Cambridge and may be regarded as the tree of the district. All those to which I require to draw attention belong to the British series. They are classified as follows by Dr. Moss in the new *Cambridge British Flora*. This table is a valuable one and I give it complete, but there appears to be no very fine example in Cambridge of the third series, which consists of one species, *Ulmus glabra*, the Wych Elm.

Series 1. *Nitentes.* Petioles long, or rather long. Laminæ of normal leaves smooth above at maturity; of the suckers, adventitious shoots, and of the summer shoots, rough above. Fruit usually obovate seed placed between the middle of the fruit and the apical notch.

Ulmus nitens, the Eastern Counties Elm; *U. stricta,* the Cornish Elm; *U. sativa,* the Small-leaved Elm.

Series 2. *Campestres.* Petioles rather long. Laminæ of all the leaves rough above. Fruit small, suborbicular. Seed placed as in *Nitentes.*

U. campestris, the English Elm.

Series 3. *Glabrae.* Petioles short or very short. Laminæ of all the leaves very rough above. Fruit large, elliptical to obovate. Seed placed in the centre of the fruit.

U. glabra Hudson, the Wych Elm (*U. montana* Stokes).

42. ULMUS NITENS Moench (*Meth. Plant.* 333 (1794), Moss in *Gard. Chron.* ser. 3. li. 199 et 217 (1912)). (Fig. 11.)

U. glabra *Mill Gard. Dict.* ed. 8, No. 4 (1768), *non* Hudson.

This is the Elm of the Eastern Counties, and many examples may be seen on the way to Cambridge on the Great Eastern Railway. It is a large, graceful tree; the lower branches are wide-spreading; the leaves are very unequal at the base, smooth and shining above; and the fruit is from oblong to obovate, with the seed between the centre and the apical notch, the notch reaching nearly down to the seed cavity. A good tree in the Cambridge Botanic Garden has been authenticated by Dr. Moss. It is 58½ ft. high and 49½ ft. in diameter.

43. U. NITENS var. SOWERBYI Moss (*Eng. Bot.* 2248, ed. 3, viii. t. 1286). (Fig. 12.)

U. glabra *Smith.*

This variety, established by Dr. Moss, was made known by Mr. E. W. HUNNYBUN. It is described as a smaller tree than var. *Hunnybuni.* The branches are shorter, and the upper ones very tortuous; the leaf-blades smaller and acute; the fruits rather smaller, obovate to elliptical. This is the tree referred to by SMITH as the Norfolk Elm. It is found in the hedgerows and woods of Norfolk, Cambridgeshire, Huntingdonshire, and no doubt elsewhere, and is often planted.

44. U. NITENS var. HUNNYBUNI Moss (*Cambridge British Flora,* ii. p. 90, tab. 90, 91).

This fine tree has been distinctively made known by Mr. E. W. HUNNYBUN, the fine artist who is collaborating with Dr. Moss in the production of the new *Cambridge Flora* now being published. It is described by Dr. Moss as a taller and more handsome tree than the variety *Sowerbyi.* It has longer branches, the lower spreading at right angles, the upper less tortuous. The leaf-blades are longer, even more asymmetrical at the base, and more acuminate. The

fruits are rather larger and more markedly obovate. It is found in the hedgerows and park lands of Essex, Cambridgeshire, Huntingdonshire, and elsewhere. The slide exhibited was from a photograph taken in the grounds of St. John's College, Cambridge.

45. U. STRICTA Lindley (Moss in *Gard. Chron.* ser. 3, li. 199 et 234 (1912); *Cambridge British Flora,* ii. 92, tab. 98, 99).

This is the Cornish Elm, well known and useful for planting on account of its upright pyramidal habit. It comes true from seed, and it is stated by ELWES to be undoubtedly indigenous in Cornwall, and he believes it to be, in all probability, a pure species. It occurs abundantly in hedgerows and on the borders of woods in western Cornwall and northern Devonshire. It also occurs rarely throughout southern England, and it is reported by Professor HENRY to occur in southern Ireland. Abroad it can be recorded only for northern France. In Cornwall the tree is of slow growth, but produces a remarkably tough wood used by wheelwrights and formerly used to make the casks in which cement and china clay were exported. It has been used also for making boxes in which gunpowder was compressed by hydraulic power, no other wood being found to bear the pressure so well. The leaf-blades are described as not very unequal, smaller than in *U. nitens.* The fruit is the same as in that species. The only tree likely to be confused with this is the Jersey Elm, *U. stricta* var. *sarniensis* Moss (*Gard. Chron.* li. 199 (1912)). It differs from the Cornish Elm in flowering earlier, in its branches ascending at a rather wider angle, and in its broader laminæ, which are quite flat and not folded inwards. It is perhaps a hybrid between *U. stricta* and *U. nitens.*

46. U. SATIVA Miller (*Gard. Dict.* ed. 8, No. 3 (1768); Moss in *Gard. Chron.* ser. 3, li. 199 et 216 (1912); Smith, *Eng. Bot.* t. 1886, in ed. 3 as *U. suberosa* var. *genuina*; *Cambridge British Flora,* ii. 93, t. 100, 101).

This is the Small-leaved Elm, a tree readily recognized by its habit and small leaves. It is distinctly an ornamental tree. The branches are rather short, lower ones wide-spreading; the leaf-blades are not very unequal at the base, smaller than in *U. nitens*; the fruit is smaller than in *U. nitens,* oblong-elliptical to obovate. The winter-buds are smaller than those of any other British Elm. The timber of this tree is said to be of excellent quality. It is found chiefly in Eastern England, but is local in Southern England from Hampshire, Gloucestershire, and Glamorganshire to Essex and Lincolnshire.

47. U. CAMPESTRIS L. (*Sp. Pl.* 225 (1753) *partim*; Moss in *Gard. Chron.* ser. 3, li. 199 (1-12); *The Cambridge British Flora,* ii. 94, t. 102, 103).

This is the English Elm, one of the tallest of British trees,* attaining a height of about 130 ft. It is a tree that confers a distinction upon Cambridge, forming as it does the feature of the well-known "Backs." The trunk is long and straight, the timber reddish and reputed to be

* The other of the two tallest trees is *Populus serotina.*

of excellent quality. The lower branches are large and wide-spreading, the upper ascending, all the main branches ending in masses of dense and heavy foliage in summer. This is probably the most dangerous of the Elms for dropping heavy branches. It is the only British Elm of the Campestres group, and the characters given for the group distinguish it. Of the leaves it may still further be stated that the blades of the terminal ones are elliptical-ovate, about 2½ in. long and 1¾ in. broad; the lower ones suborbicular, subcordate, and asymmetrical at the base, doubly serrate, rather acuminate, hairy and rough above, softly hairy beneath; those of the suckers much smaller, narrower, and rougher above.

Hybrids.

48, 49. There are two important hybrid Elms, both referred to *U. glabra* × *nitens* by Dr. Moss (see *Gard. Chron.* ser. 3, li. 198 (1912)). These are *U.* × *vegeta* Schneider, the well-known Huntingdon or Chichester Elm, and *U.* × *hollandica* Miller, the Dutch Elm. The latter is *U. montana* var. *major* Syme, *Eng. Bot.* viii. 142 (1868). *U.* × *vegeta* constitutes the well-known Brooklands Avenue at Cambridge. It is the strongest-growing of all the Elms, and is a magnificent tree where there is sufficient space, but where there is not sufficient space, as in some cases of its use at Cambridge, it is entirely out of place. Shoots, it is said, may grow to a length of 10 ft. in one season and the leaves may be 5 or 6 in. long, while trees 30 ft. high may be grown in ten years from the graft. The strength of growth exhibited by *U. vegeta* is accounted for by its being a hybrid, and hybridizing for the production of good timber in the shortest possible time is now one of the great ideas in forestry. This hybrid Elm was said by Mr. John Wood (see Loudon's "Arboretum") to produce the best timber of all the Elms. It was raised about the middle of the eighteenth century in the nursery of Messrs. Wood & Ingram, of Huntingdon, from seed gathered in Hinchingbrook Park. The slide of *U. hollandica* exhibited represented the first of a row of trees on the Madingley Road, just before reaching the entrance to the grounds of the Observatory and on the same side. The suckers and some of the branches are remarkably corky. This Elm is apparently more productive of suckers than any other, and where the trees occur in a hedgerow they appear to displace the Quick, and some hedges are entirely composed of them. This Elm is said to have been brought to this country from Holland by William III. Its timber is said to be very inferior.

50. Another hybrid Elm, also between *Ulmus glabra* and *U. nitens*, for which a name has not been determined, is represented by fine examples outside Emmanuel College.

* * * * * *

During the lecture, without any suggestion that circumstantial evidence is always neglected, attention was drawn to its value in the determination of what a plant may be. The first illustration was in the

case of *Quercus obtusata*. Here is a Mexican Oak so like the common pedunculate Oak that a diagnosis of the one is almost the same as the diagnosis of the other, the contrast being hardly more than a slight difference in the length of petiole, a difference that might easily occur in the same species. In the case of the Mexican Oak, however, the leaves may remain on the tree until March, and it was pointed out also that leaves may suffer from cold winds early in December or remain uninjured with slight protection, features that are evidence of a constitution quite unlike that of the pedunculate oak. Another instance was given in the case of *Tilia petiolaris*, regarded by ELWES and HENRY as a variety of *T. tomentosa* (*T. alba*); other botanists, however, believe that this tree is distinct as a species. Ordinary evidence to this effect is found in the greater length of petiole, but it is supported by the fact that the flowers are poisonous to bees, an indication of some essential difference, though it may be admitted that, according to report, plants may vary in being toxic or not, *e.g. Solanum nigrum*. A third instance was mentioned in the case of the Lombardy Poplar. It is usually regarded as a fastigiate form of *Populus nigra*. DR. MOSS, of the Cambridge Herbarium, however, remarks that the differences are numerous, and he, as well as other botanists, believes that it must occur in a wild state. Here it may be pointed out that the shape of the tree is very unusual for a wild one—in nature the leaf-system of a tree is not subjected to the disadvantage of this habit of growth—and the lecturer suggests that, while probably not a fastigiate form of the common Black Poplar, it is a fastigiate form of an ally not yet recognized, and is therefore not entitled to specific rank as *Populus italica*.

An interesting point forced itself upon the attention when taking the measurements of trees at intervals of three or four years, though it is in fact nothing more than might be expected. This point is with regard to the altering relation of diameter to height as growth proceeds and age increases. It appears that under certain given conditions a tree may cease to gain much in height—while under other conditions capable of growing much taller—and instead gain much in spread of branches. There are several instances in the Cambridge Botanic Garden, and this seems to show that it is not a case of individual peculiarity, but one instance may suffice—that of *Paulownia tomentosa*, of which there is a healthy and free-flowering tree in the Cambridge Garden. In the Paris Botanic Garden there is a tree that was 60 feet high in 1904, and at Westonbirt, Gloucestershire, a tree that was 56 feet high in 1911. At Cambridge a tree that is now 23 feet 4 inches high has gained only the odd 4 inches in four years while increasing in diameter from 27 feet to 28½ feet in the same time. Other, even more striking, instances could be given.

The lecturer desired to ask that observations should be made by those who have the opportunity with regard to the power that trees seem to have of altering the direction of large branches for the purpose of disposition to the best advantage. All the lower branches

of the fine *Quercus obtusata* were formerly horizontal, having to extend over a ring of *Quercus Ilex*. This ring, in order to open out so important a specimen, was removed some years ago, and now the lower branches are bent towards the ground, so that the original trees of *Quercus Ilex* could certainly not be replaced. These lower branches that have changed direction are about from 2½ to 3 inches in diameter. It is not possible that weight of foliage can have lowered these branches. Another interesting case showing apparently a redisposition of heavy branches may be mentioned in a fine *Cedrus Libani*. Some years ago a big limb was blown entirely out of the tree, leaving a big, ugly, and conspicuous space. Now it would be impossible for any stranger to say that a limb had ever been lost, though still some evidence of the scar on the main trunk remains. Probably the growth of the main trunk has altered the disposition of branches; but the nature of the tree is such that the filling up could not have been effected by new growth of the branches themselves.

List of Trees.

The references are to the numbers preceding the name of the tree in the text.

Acer creticum, 8
  Ginnala, 31
  monspessulanum, 8
Ailanthus glandulosa, 27
Asimina triloba, 7
Berberis Fremonti, 12
Betula papyrifera, 26
Cedrela sinensis, 30
Cercis Siliquastrum, 9
  canadensis, 9
Citrus trifoliata, 25
Crataegus tanacetifolia, 28
    var. glabra, 28
Drimys Winteri, 23
Ephedra nebrodensis var. procera, 5
Eucalyptus Gunnii, 24
    var. montana, 24
Fendlera rupicola, 38
Garrya elliptica, 21
Hippophaë salicifolia, 16
Juglans nigra, 29
Juniperus excelsa, 18
Koelreuteria paniculata, 32
Larix dahurica, 3
    var. pendula, 3
Paulownia imperialis, 22
  tomentosa, 22
Phellodendron amurense, 37
  japonicum, 37
Pinus Gerardiana, 1
Pinus monophylla, 17
  montana uncinata, 2
  Mughus, 2
  Pumilio, 2
Populus italica, 41
  nigra viridis, 40
  serotina, 39
Prumnopitys elegans, 19
Prunus pendula, 35
Pterocarya caucasica, 10
Pyrus Aria, 34
  Sorbus, 33
Quercus obtusata, 6
Rhus Osbeckii, 36
Rosa Brunonii, 14
  macrophylla, 13
  moschata, 14
Sophora japonica, 11
Thuja orientalis var. pendula, 4
Tilia petiolaris, 20
Ulmus campestris, 47
  × hollandica, 49
  montana var. major, 49
  nitens, 42
    var. Hunnybuni, 44
      Sowerbyi, 43
  sativa, 46
  × vegeta, 48
  glabra × nitens unnamed, 50
Xanthoceras sorbifolia, 15

FIG. 13.—CORNUS NUTTALLII IN FULL FLOWER.

[To face p. 20

FIG. 14. ABIES SUBALPINA AT TIMBER LINE IN THE OLYMPICS.

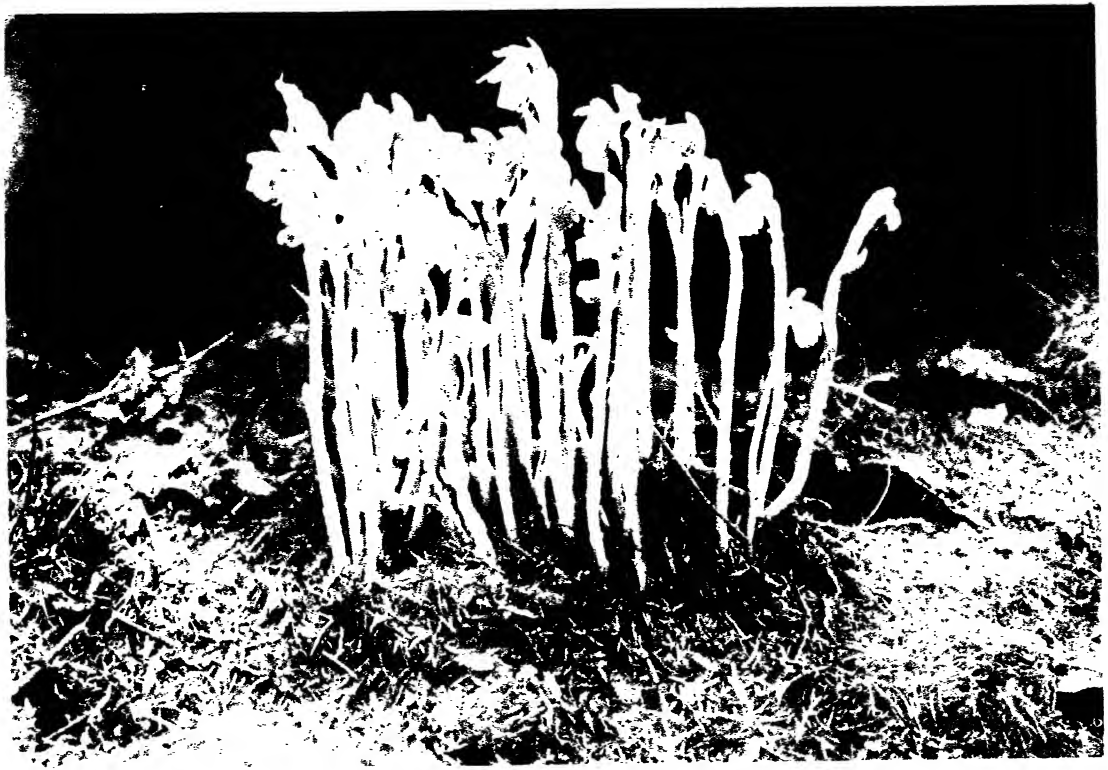

FIG. 15.—MONOTROPA UNIFLORA.

FIG. 16.—ABIES SUBALPINA AND ERYTHRONIUM MONTANUM.

[To face p. 21]

THE TREES AND SHRUBS OF THE PACIFIC COAST.

By F. R. S. Balfour, M.A., F.R.H.S.

[Read April 13, 1915; Dr. F. Keeble, F.R.S., in the Chair.]

In the time at my disposal it is only possible to speak shortly on the flora of a few picked regions in that long stretch of country which used to be known, rather inaccurately, as the Pacific Slope. I have made several expeditions in various mountain regions from British Columbia to Southern California, and I think the four districts I have chosen will be fairly typical of the differences in the flora of the whole region—differences brought about by rainfall, latitude, and altitude.

First I will treat of that corner of the United States, still largely unexplored, known as the Olympic Mountains. Its most remote corner, Cape Flattery, was the first land sighted in Vancouver's great expedition of 1792. Its mountains hardly exceed 8,000 feet; its deep valleys are clothed with dense forests and an undergrowth of shrubs of many species which alone deserve a handbook to be written about them. So far as I know, there is no open country at all throughout the region, and consequently there are practically no inhabitants, with the exception of the two or three small towns on the coast of the Straits of Juan de Fuca, opposite Vancouver Island, and the few Indians on the ocean or western side.

Some years ago I made two expeditions into the main range of these mountains from the south, and more lately penetrated the forests from the north by following the Elwha river, which debouches into the sea at Port Angeles. No tree or shrub has yet been found to be peculiar to the Olympic Range, though vast areas still remain for botanical exploration.

To speak first of the few broad-leaved deciduous forest trees of the region which are always in the floor of the valleys, there are only three, but each is the largest member of its genus—*Acer macrophyllum*, *Populus trichocarpa*, and *Alnus oregona*. The poplar when crowded by conifers often exceeds 200 feet; its sweetly-scented leaves always recall to me the pleasures of fishing trips in that delightful country; no introduction into our British climate seems to give more promise of becoming a great tree than this. *Arbutus Menziesii*, the madroña of the Spanish settlers in California, is the finest evergreen in all that country. I never found it of any size in the Olympics, though north on Vancouver Island it grows 80 feet high, and far south, near San Francisco, there are huge hollow trunks of living trees 12 feet in circumference. It is much the most striking of any Western tree, with its crimson peeling bark and large leathery leaves. *Cornus Nuttallii*, the only tree of its

genus on the Pacific Coast, is often 60 feet high or more, and its large white involucral bracts are conspicuous in the dark shade of the conifers. My photograph (fig. 13) is of a tree on Vancouver Island and will give some conception of the extraordinary profusion of its blossom. I am indebted to Mr. F. W. GODSAL for this picture. In autumn it is equally beautiful from the gorgeous crimson and orange of its foliage and fruits. Of conifers, *Thuya gigantea* is of immense size where the alluvial soil of the valleys is deep, but you do not see it high above sea-level in the Olympics. *Abies grandis* is the commonest and the largest of the silver firs; strangely enough, I never saw *Abies amabilis* here, though SARGENT speaks of it as occurring throughout the range. Douglas fir is universal and taller than any other tree. I have a photograph of it showing an unbroken stretch rising above a little log hotel on Lake Cushman, where the trout run big. The Western Hemlock firs, with their graceful nodding tops, are never quite so large in girth as the Douglas, but surpass them in the amazing way they reproduce themselves wherever the seed finds a foothold. *Tsuga Hookeriana, Abies subalpina* (fig. 14), and *Pinus contorta* occur fairly generally at the timber-line. The great 'sword fern' *Aspidium munitum* throws its fronds up to two yards long in all the moister spots, and the maidenhair of America, *Adiantum pedatum*, clings to faces of the rocks.

There are several small trees which deserve mention: *Malus rivularis, Prunus emarginata* (the fruit of neither is beautiful, but I never saw them in blossom), *Sambucus melanocarpa*, and *S. racemosa, Nuttallia cerasiformis, Crataegus Douglasii, Amelanchier alnifolia*, producing the "saavis" berries of the Indians, several species of willow, *Corylus californica*, and *Taxus brevifolia*, the last two practically the same as our hazel and yew respectively. *Rhamnus Purshiana* is common as a small tree in the southern valleys of the region; the bark provides the *cascara sagrada* well known to pharmacists. I got a considerable quantity of the seed of this and of *Rhamnus californica* a few years ago, which was widely distributed from Kew. It is a plant of the easiest cultivation almost anywhere in Great Britain; perhaps my effort may result in a new industry, as the native supply of the bark is being rapidly diminished in the more accessible country. The barks of both species from my seed seem to possess the same virtues as that of the native-grown trees. *Acer glabrum*, which I never saw larger than a many-stemmed large bush, will probably be distinguished by botanists as a species distinct from the small tree to be found in the drier valleys of the interior hitherto identified with it, but in several respects differing from the coast plant.

Western Washington is pre-eminently a land of shrubs; there are blaeberries so high that you can gather the fruit above your head as you ride through a thicket of them. *Vaccinium parvifolium, V. ovalifolium*, and the evergreen *V. ovatum* all bear fruit so profusely that the Indians find a coarse wooden comb the easiest way of gathering it, to be sold later to the greengrocers of Tacoma and Seattle.

Only in one locality, and that near Hood's Canal, to the south-east of the region, have I seen the handsome crimson rhododendron, *Rhododendron californicum*—the Western counterpart of *R. catawbiense* of the East. There are several Spiraeas, including those so familiar to us as *Spiraea ariaefolia*, *S. Douglasii*, and *S. Aruncus*; also many Ribes both of the currant and gooseberry types, none more beautiful than *R. sanguineum*, *R. Lobbii*, and *R. bracteosum*, which are perhaps the commonest. Of the brambles the most conspicuous are *Rubus leucodermis* and *R. spectabilis*, the one with purple, the other with transparent yellow fruits.

Rubus nutkanus forms great thickets with its broad-leaved sprays. The insignificant fruit is appreciated only by the black bears of the country, and is a disappointing result of such beautiful blossom.

There are five or six species of *Pyrola*, including *P. uniflora*, and *P. rotundifolia* with its pink bell-flowers. It is remarkable in the dense woods of the Olympics what numbers of saprophytic plants one sees. Most strange of the saprophytes is the *Pterospora andromedea*, which seems to be found on or near *Gaultheria Shallon*, and the ghostly *Monotropa uniflora* forcing its way up among the pine needles (fig. 15).

Of alpines and bulbous plants there are fewer species than in the main Cascade range, where there is opportunity of north and south migration, though several species are confined to this Olympic region. *Lilium columbianum* is universal, nowhere in such quantities as one sees *L. pardalinum* in California. *Mimulus Lewisii* makes bright patches of crimson among the stones of the rivers, where here and there it mingles with the yellows of *Epilobium luteum* and *Mimulus Langsdorfii*. *Erythronium montanum* (fig. 16) grows everywhere, perhaps especially common on the sunny banks where the soil is too thin for the big trees to get a foothold, and *Arctostaphylos tomentosa* and *A. Uva-ursi californica* cover the ground with their grey dusty foliage. I must mention the delicately beautiful *Clintonia uniflora*, the speckly-leaved *Goodyera Menziesii*, and *Linnaea borealis*, which climbs over the stones among the mosses, the last a rather larger-flowered plant than its European form. Under the firs the so-called 'Prince's Pine' makes an evergreen carpet; there are two species—*Chimaphila umbellata* and *C. Menziesii*—the former common to all the Northern Hemisphere.

In the damp and shaded hollows much the most conspicuous plant is *Panax horridum*, with its handsome leaves and scarlet berries; its name does not belie it, as dark stories are told of how men overtaken by night in the forests and getting into a thicket of it have succumbed to its terrible and poisonous thorns. *Acer circinatum* sends its long, green, willowy branches in arches which touch the ground and spring again. Its pale-green seven-lobed leaves are as delicate and beautiful as any Japanese maple, in my opinion. *Berberis nervosa*, so greatly preferred by DAVID DOUGLAS to *B. Aquifolium*, is the commoner

of the two. It is strange that this plant, introduced by DOUGLAS, is much the rarer in our shrubberies; in my country of Tweeddale it grows just as readily. There are two Roses, *Rosa nutkana* and *R. gymnocarpa*, both fairly well known in our gardens, and two creeping brambles, *Rubus ursinus* and one with glabrous leaves—*R. nivalis*—also the charming little *R. pedatus*. There are two Aucuparias, *Pyrus sitchensis* with glossy leaves and crimson fruit, and *P. occidentalis* with dull leaves and coral-coloured fruit, quite unlike that of any other Aucuparia; neither, I believe, is in cultivation

The next region which I have chosen to speak about is that surrounding Mount Rainier, the highest peak of the Cascade Range, an extinct volcano of over 14,000 feet. Fifteen years ago I rode over a woodland trail to the base of this splendid mountain; now a light railway through the forest takes you from Tacoma to within a few miles of what has become a National Reserve or Park of over 200,000 acres surrounding the mountain. One passes through splendid timber—*Thuya gigantea*, *Picea sitchensis*, Douglas firs, *Cupressus nootkatensis*, *Abies nobilis*, *A. amabilis*, and *Pinus monticola*—in this region; indeed, there is one point close to the foot of the Nisqually Glacier, the principal glacier descending from the mountain, where I counted twelve species of conifers in sight at once.

Mount Rainier is the highest mountain in the U.S A., and was discovered in May 1792 by VANCOUVER and named in honour of his friend, Admiral PETER RAINIER. One of my slides shows the mountain from Puget Sound, fifty miles away, and must have been taken from very near the standpoint reached by VANCOUVER when the drawing was made of the mountain by one of his crew, reproduced in "Vancouver's Voyage."

Our camp was in Paradise Valley, an open tract above timber-line now reached by the Government Road. Professor SARGENT once spoke of it to me as the finest alpine garden in the world, and my photograph (fig. 17) will show that it is not surpassed by even the Tyrolese mountain meadows. On the sides of the glacier lower down was growing *Alnus sitchensis*, with here and there a common juniper; higher up, *Tsuga Hookeriana* had taken the place of *Tsuga Albertiana* and *Abies subalpina*, and *A. amabilis* that of *A. nobilis* and *A. grandis*. There were dense shrubberies of the charming small-flowered *Rhododendron albiflorum* mingling with the heaths *Bryanthus empetriformis* and *Cassiope Mertensiana*; higher still grew *Vaccinium deliciosum*, remarkable for its sweet purple fruit, as large as a small grape. I have succeeded in raising a good many plants in Surrey, and I believe it to be a new introduction. Another interesting Ericaceous plant with beautiful scarlet fruit gathered by me at the same time is *Gaultheria ovalifolia*, of which the plants I sent succumbed on the journey, but our Society has raised a quantity from my seed at Wisley; this, too, is new to cultivation.*

* Since this was written I have seen *Gaultheria ovalifolia* in cultivation in the Edinburgh Botanic Garden.

Fig. 17.—Abies amabilis, Aster pulchellus, and Veratrum viride on Mt. Rainier.

[*To face p.* 24.

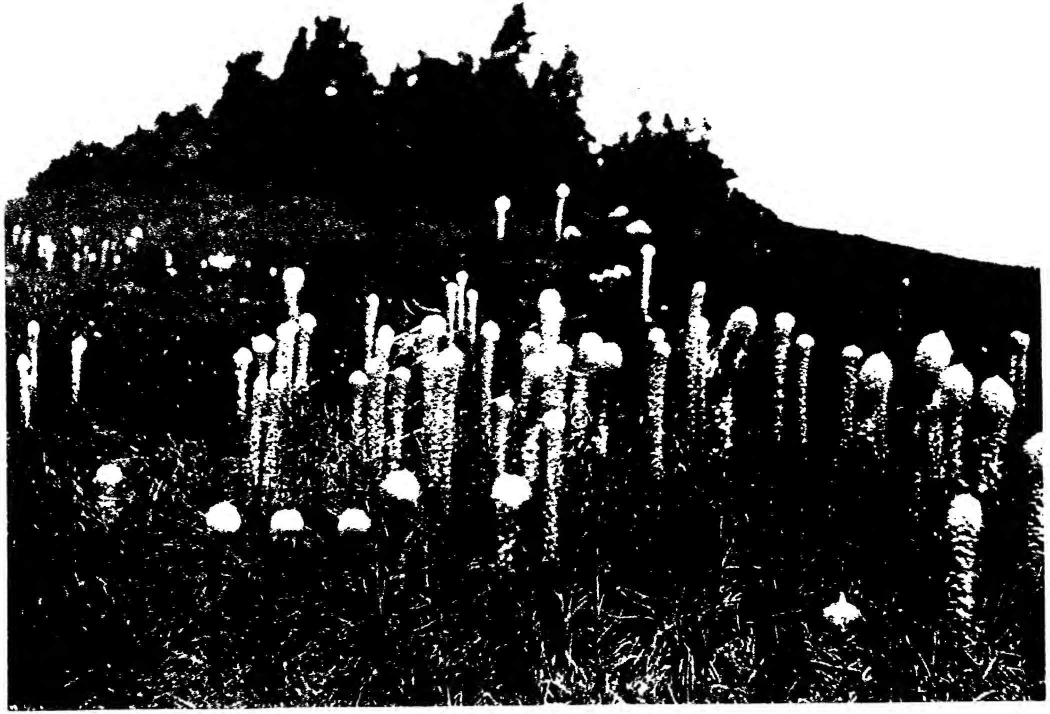

FIG. 18.—XEROPHYLLUM TENAX.

FIG. 19.—PICEA BREWERIANA IN THE SISKIYOU MTS.

FIG. 20 — PICEA BREWERIANA ON THE OREGON AND CALIFORNIA BOUNDARY.

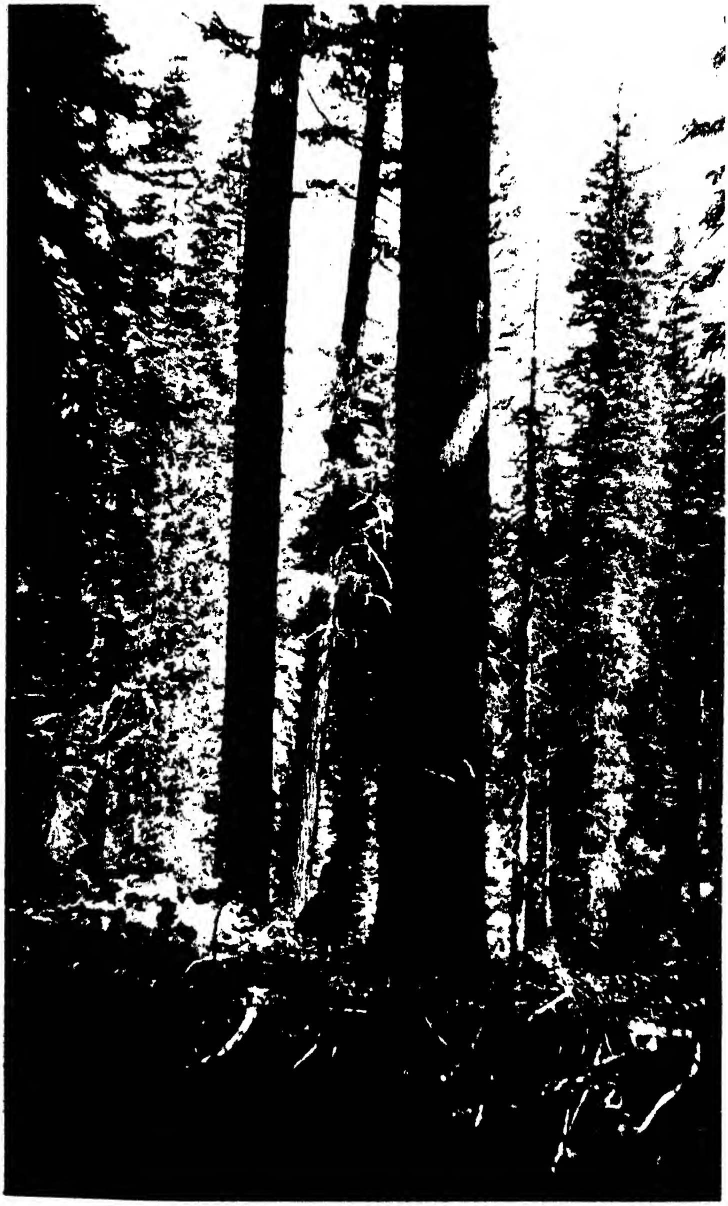

FIG. 21.—PINUS LAMBERTIANA NEAR MT. SHASTA.

FIG. 22.—PINUS LAMBERTIANA.

FIG. 23.—CUPRESSUS MACROCARPA AT MONTEREY.

Fig. 24.—Cupressus macrocarpa at Monterey.

Of the flowers in the alpine meadows, time will not permit of my mentioning more than a few of the more conspicuous. There were two beautiful Asters, *A. pulchellus* and *A. ledophyllus*, *Gentiana calycosa*, *Pentstemon Davidsonii*, *P. Menziesii*, *Polygonum bistortoides*, and *Veratrum viride*, indistinguishable from its alpine kinsman. The marshy ground was gay with *Dodecatheon Jeffreyi*, *Erythronium montanum*, and the white marsh marigold *Caltha leptosepala*. Higher up still we found at the limit of vegetation *Vagnera amplexicaulis*, *Lupinus Lyallii*, *Saxifraga Tolmiei*, and *Lutkea pectinata* growing at about 7,000 feet. Within a stone's-throw of our tent were *Veronica Cusickii* and another *Veronica* I was not able to identify, with *Phlox diffusa*, *Solidago multiradiata*, and a charming plant, *Potentilla flabellifolia*. *Gaultheria Myrsinites*, a very minute shrub two inches high, grew among the rocks where the wind had laid the ground bare of snow. *Pulsatilla occidentalis*, which is perhaps the commonest flower in those wonderful natural gardens, is hardly to be distinguished from our own wind-flower, though larger.

The only tree of that country which cannot be seen in cultivation is *Pinus albicaulis*, rare on the southern side of the mountain, but not so on the heights of most of the western ranges. The slide exhibited showed a learned German professor gathering a cone from one of the few trees we saw, but I fear the squirrels and Clark's crows had been before him in getting out the seed. I have never yet been able to gather the cones before these marauders had stolen the seeds.

I cannot leave the North-West without mentioning that locally much-despised arum, *Lysichitum camtschatcense*, which fills the marshes in the valleys in April with its immense yellow flowers, and later with its leaves, often 3 feet long by a foot across. 'Skunk cabbage' is the term of opprobrium given to it in the West. Its huge succulent roots go deep into the bogs, and one would require trenching tools to get them out. The fine clump growing against the north side of the large temperate house at Kew shows how well it likes our climate. On the higher meadows the scarlet *Castilleja purpurascens* and several other species of this remarkable plant mingle with the snowy blossoms of *Valeriana sitchensis*. *Castilleja* or "Indian paint-brush" is one of the alpine genera of these mountains quite unrepresented in the Old World. At timber-line and also lower down, where the trees are high, we found that strange plant which DOUGLAS often mentions—*Xerophyllum tenax* (fig. 18); from the grassy leaves the Indians weave their baskets, which accounts for its local name of 'squaw-grass'; I have seen it flowering well in the Edinburgh Botanic Garden.

We now turn to the mountain range called the Siskiyous, which lies on the boundary between S. Oregon and N. California. I made my expedition there principally to see what is perhaps the rarest conifer in the world, *Picea Breweriana* or 'Weeping Spruce' (figs. 19, 20). It is supposed that not over 5,000 of these trees exist, and a forest fire might some day exterminate them. After a somewhat

arduous expedition, with horses, of over 100 miles from the railway, I was rewarded by finding two groves of this very distinct tree growing on the Oregon side of the ridge at about 4,000 feet. The drooping branchlets hang downwards 6 or 8 feet long, like those of a Babylonian willow.

On our journey we passed many splendid specimens of that finest of all pines, *Pinus Lambertiana* (figs. 21, 22), with its 20-inch cones hanging from the ends of its branches. The symmetrical outward sweep of the branches is most beautiful; the few trees growing in Great Britain give no idea whatever of this magnificent tree in its native land. *Pinus ponderosa* is the prevailing timber of the region; the broad red plates of bark show up strikingly in the sunshine among the grey sparse undergrowth of Manzanita and *Ceanothus*. The rainfall is much less than in the Puget Sound country, and consequently there is not the deep growth of moisture-loving shrubs, mosses, and ferns. In the open boggy places we saw thick clumps of the pitcher-plant, *Darlingtonia californica*, which grew mingled with gentians. The lower woodlands contain fine trees of those tall evergreens *Quercus densiflora*, *Castanopsis chrysophylla*, and *Umbellularia californica*; all three grow fairly well in the south of England, but give no promise of becoming the stately trees they are in Southern Oregon. Indeed, the timber of the Californian bay is large enough to be used for furniture-making, and is a good deal prized. *Prunus demissa*, a Western Padus, was covered with its tassels of scarlet fruit. We passed a few trees of *Chamaecyparis Lawsoniana* on our way to find the 'Weeping Spruce'; the climate was too dry for it, however, and it is not seen as a fine tree till nearer the coast, where it attains an immense height. *Abies Lowiana*, *Libocedrus decurrens*, and the form of *Pinus ponderosa*, sometimes distinguished as the species *P. Jeffreyi*, were common. On the open ground of the plains were *Quercus Wislizeni* and *Quercus Garryana*, the former an evergreen, and the latter perhaps more like our own pedunculate oak than any other of the many species of the Pacific Coast.

I have chosen for my fourth locality the Monterey neighbourhood, 80 miles south of San Francisco, on the coast. A small area of a few square miles, battered by all the gales of the Pacific, is the natural habitat of two trees which I suppose have been more widely distributed over the world than any others. *Pinus insignis*, which also occurs on a few of the islands of Southern California, and *Cupressus macrocarpa*, which is only found at Monterey, have long ago been introduced to Western and Southern Europe, the Cape, Chile, and New Zealand, where they can be seen thriving as in their native California. It is a remarkable fact that species so adaptable to different soils and climates should in their own habitat be confined to so tiny an area. My photographs (fig. 23, 24) show picturesque and gnarled trees of the cypress which must be of great age. *Pinus insignis*, perhaps the fastest growing of any pine, is not long-lived, and I doubt if trees of it exist older than 150 years.

In the open country of the foothills are many fine evergreen oaks; I have photographs of two of them, *Quercus agrifolia* and *Q. chrysolepis*, also of the great 'Valley Oak,' *Q. lobata*—a deciduous tree and the largest oak of the many Californian species.

Perhaps as interesting as any of the many trees we met was a grove of that rarest of all silver firs, *Abies bracteata*, on the Santa Lucia Mountains, not far from Monterey; *Pinus Torreyana* is a very rare tree found growing on a few of the islands and on the coast of the mainland. Its rarity is my excuse for mentioning it, as it occurs far to the south of Monterey.

ON KEEPING ORCHARDS CLEAN.

By Professor H. M. LEFROY, M.A., F.Z.S., Entomologist to the Society.

[Read February 2, 1915, Mr. E. A. BUNYARD, F.L.S., in the Chair.]

THE title of to-day's lecture sums up the most practical advice that can be given to the fruit-grower in this country, and I will try to show why it is of such importance. Keeping orchards clean has a value from more than one point of view, but I have treated it solely from a rather neglected one, that of the entomologist who seeks to prevent the great waste of fruit caused by insect pests in orchards. It has a significance also from the horticultural point of view, and very definitely from the fungus-disease aspect, but it will be sufficient to-day to deal with it as it applies to insect pests.

Our fruit-trees suffer from a variety of pests which fall into two classes: the constant pests, such as the Woolly Aphis, the Mussel Scale, the Apple-sucker, the Codling Moth, the Pear Midge, and a few others; and the occasional pests, far more numerous in kind, far less important individually, which occur sporadically and irregularly on fruit trees, which are not always present in abundance and so are not noticed, but which by their total effect cause a serious loss to the crop.

It is possible to take vigorous direct measures against any one of the first class: if one has Apple-sucker one sprays for it, and if one does not it becomes an increasing pest. It is impossible to take direct measures against each casual pest, since one never knows whether they will occur; against them one can only adopt general measures, act on broad lines, and use methods devised generally to check any of this class of pest from becoming abundant on our fruit trees. They cannot be checked on their wild food-plants, but something can be done to discourage their activities in orchards.

You may consider the importance of the latter class of pests is being exaggerated, and think of orchards you know in which there has been no very obvious destruction by insects the year through—the trees have not died, they have not been devastated by caterpillars, there has been the usual amount of fruit—but the damage shows itself clearly and definitely when the fruit ripens. How much of the fruit is perfect? How much can be put away and kept? There is usually an enormous percentage of fruit that is damaged, that will not keep, that is just a little flawed; all this is avoidable if one can check the pests, and it is this kind of damage that these varied insects cause. One should get every apple off the tree perfect, the skin

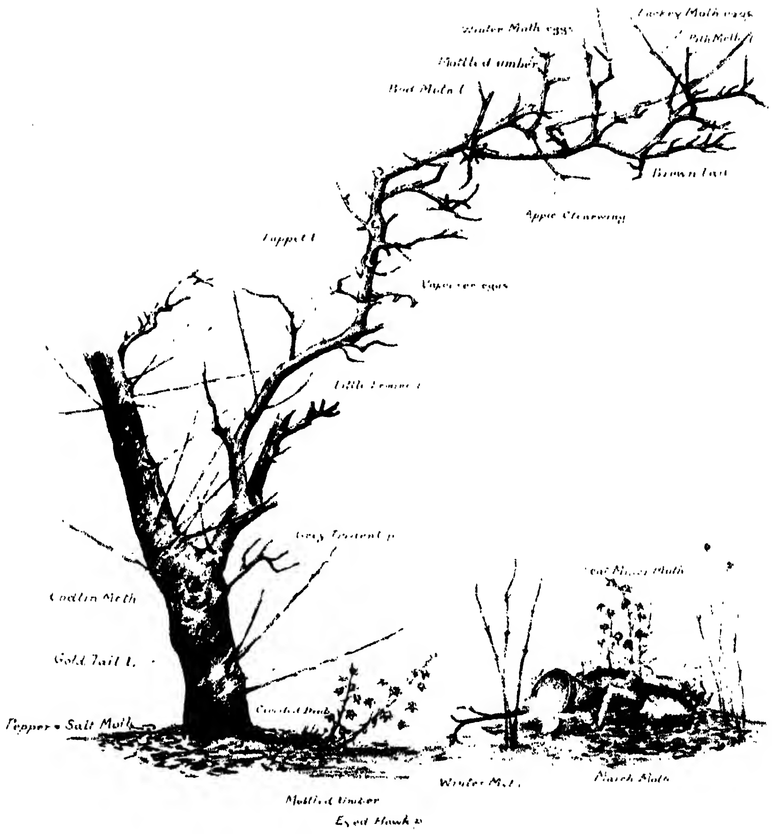

FIG. 25. THE WINTERING OF APPLE PESTS.

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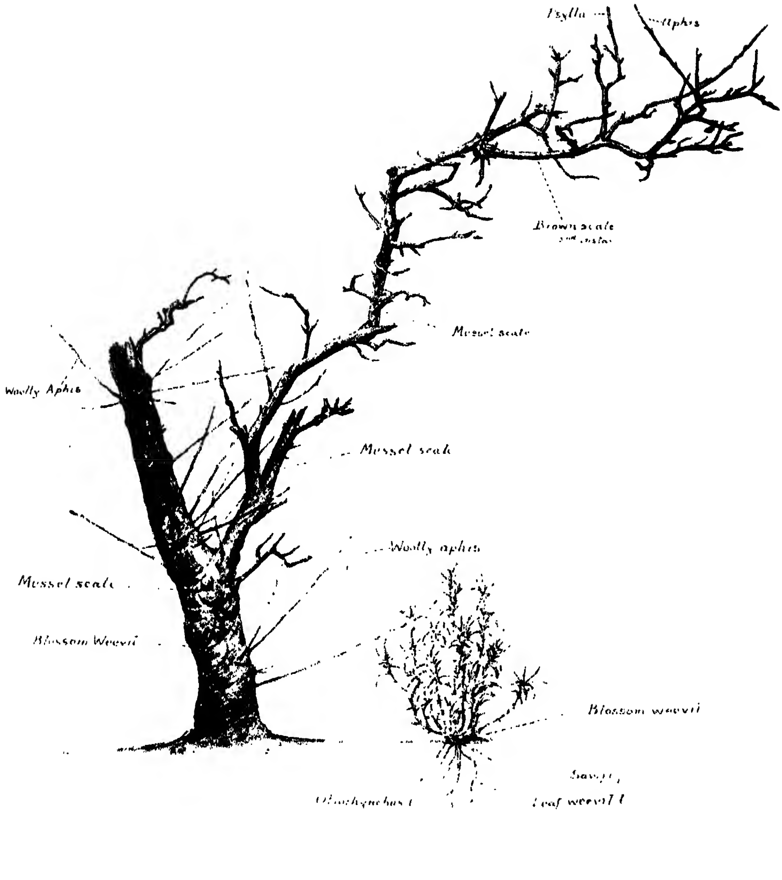

FIG. 26.—THE WINTERING OF APPLE PESTS.

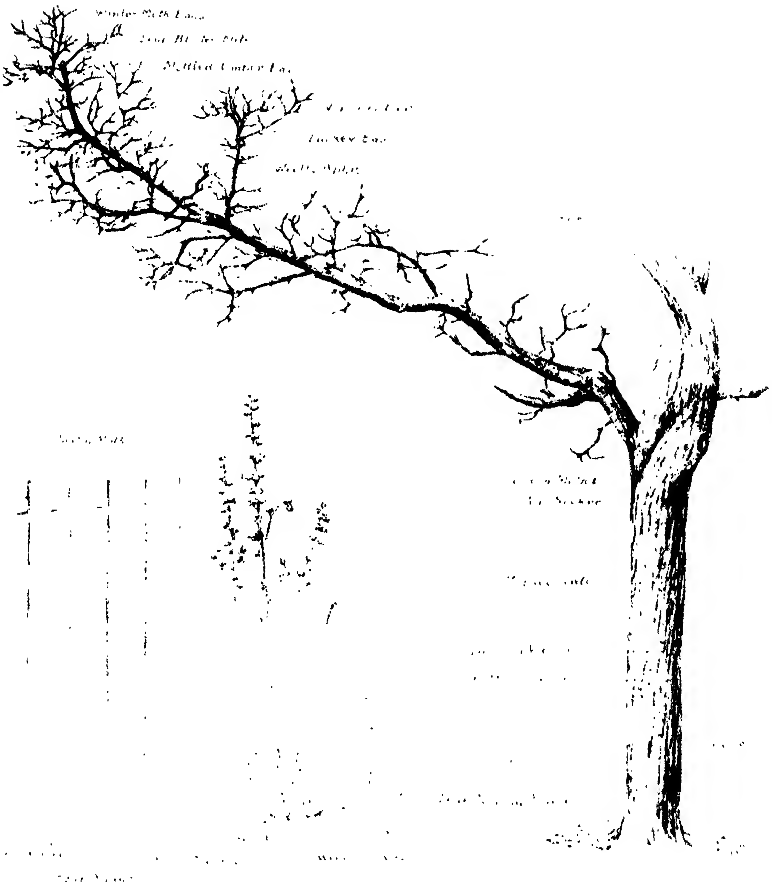

FIG. 27.—THE WINTERING OF PEAR PESTS.

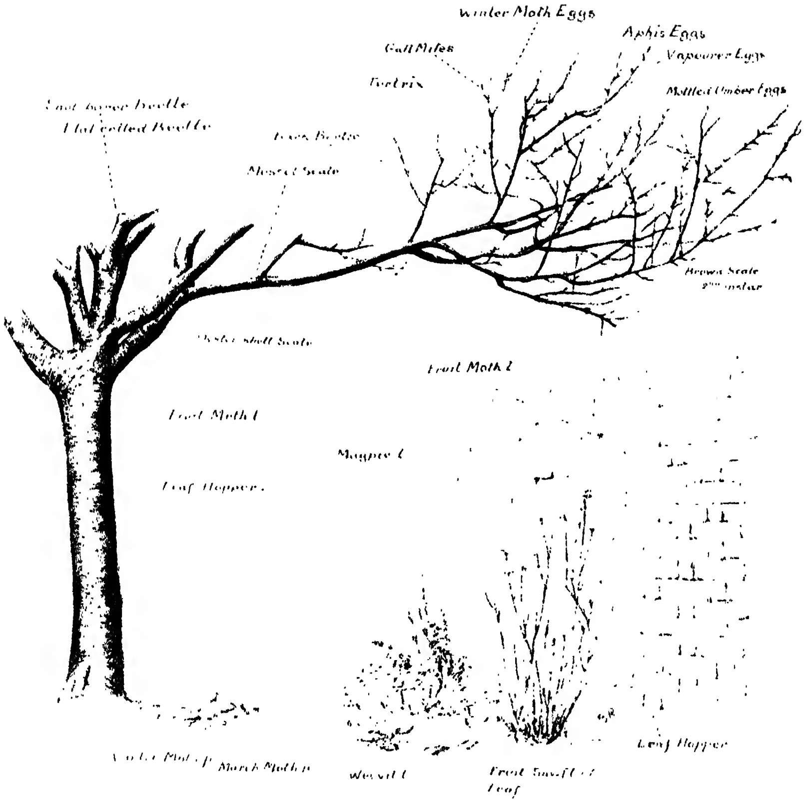

FIG. 28.—THE WINTERING OF PLUM PESTS.

[To face p. 29

uninjured, no worm in it, no decay commencing, and be able to store every one; but we are all so used to the present state of things that we cannot easily realize such an ideal condition.

In this country one thinks of an orchard as a pleasant spot, whether in winter, when the trunks are in their full beauty, or there is snow; in spring, when the sheet of white or pink-tinged blossom is in its full glory; in high summer, when one sleeps afternoons in the deep shade; or in later summer, when the fruit hangs golden or fire-red amid the tinted foliage. One thinks of an orchard as a pleasant, grassy place, the trunks covered with moss and lichen, the branches gnarled and twisted, the trees of varied kinds growing in what were once lines, but now free from any stiff and formal order.

This is the old-world orchard, attached usually to the old garden, and having one marked characteristic, the uncertainty of the yield of fruit, and the doubtful quality of the fruit that is got.

One may contrast this with other orchards, of young trees or of trees in full bearing: in these, orderly lines of trees of the same age, the trunks smooth and clean, the branches straight, with even bark and clean lines; the trees in blocks of one variety or in rows of alternating kinds, of similar height and growth; and, below, clean tilled soil, or bushes and bulbs, or some other ground crop.

This is the business orchard, grown for one purpose, to yield fruit, whether for the market or the home, and it is in this orchard that the most is won for the use of man, and the least given to the voracious insect hordes that seek to possess it.

It is my business to-day to show why it is that the delightful old orchard is the haunt of insects, and how directly cleanliness and clean cultivation affect the yield of fruit.

We all know in a general way that in summer insects are busy, and that in winter most are dormant; but where are they exactly, and in what stage do they pass this period of defenceless inactivity? The diagrams (figs. 25–29) show for each tree the position of the dormant form of the principal pests.

The Apple.—When one sees an apple tree covered with snow one is apt to imagine that there can be no insects upon it; in figure 25 are shown the winter forms of the best-known pests.

The Lackey-Moth has laid its ring of eggs and the Vapourer may in summer have laid eggs on its cocoon; in late winter the eggs of the Winter Moth, the Mottled Umber, and other Geometers will be found; the young caterpillar of the Bud Moth is in its winter case at the base of the bud; the Brown-tail caterpillars are in their nest among the twigs; the Pith Moth caterpillar is in the twig, and stretched on the bark of the branches are the young caterpillars of the Lappet Moth; further down, the tiny caterpillars of the Ermine Moth are sheltering under the old egg-shells, and, beneath the bark scales, the Codling larva has spun its shelter and is waiting, as a caterpillar, till the spring. The Gold-tail caterpillars are hidden in crevices of the bark, and such occasional pests as the Grey Trident may be wintering

on the trunk. At the soil surface or just below it are, in early winter, the chrysalides of the Winter Moth, Mottled Umber, March Moth, and other Geometers; deeper down, the large chrysalides of the Eyed Hawk Moth; in rubbish near by will be the moth of the Leaf Miner and perhaps Codling larvæ, which have found a safe, dry shelter for the winter.

These are all caterpillars, but the next figure (fig. 26) shows other pests; the Apple-sucker winters as eggs on the twigs, as do the Apple Aphides; the Brown Scale is in the second stage on the smaller branches; further down, and on the trunk, is the Mussel Scale; on the soft shoots are the Woolly Aphides, which in the south are active often right through the winter; the Blossom Weevil is hiding in the bark or in shelter at the roots; the Leaf and Bud Weevils are in the grub stage at the roots of weeds near by, some 6 inches deep in the soil.

The Pear.—The Pear tree has fewer insect pests, but still many common to the Apple and a few peculiar to itself (fig. 27).

At the buds, under the bud scales, the Leaf-blister Mite waits for the spring; among the twigs, in late winter, are the eggs of Winter Moth and Mottled Umber; the Lackey lays its egg-rings, and the Vapourer may have laid eggs. Dead twigs and branches harbour the Bark Beetle; on the trunk and larger branches the Mussel Scale, and in the cracks and crevices the Pear-sucker lives over its dormant time; Codling Moth larvæ live under loose flakes of bark; the Blossom Weevil hides in sheltered spots; on the stem shoots are the Grey Pear Aphis, especially in autumn; the pupæ of the Leaf-blister Moth hide under the bark or at the soil at the crown; in the soil are the pupæ of Winter Moth and Mottled Umber, the larvæ of the Slug Worm and the Social Pear Saw-fly; the two distinctive midges, Pear-fruit Midge and Leaf-curling Midge, are safe in the soil perhaps 4 inches down. Pear Thrips too has gone there for shelter, and spends the winter in a resting state. Weevil larvæ live on the roots both of the tree and of weeds or herbaceous plants they like. In any fence or shelter near by, in any refuse or rubbish, are Codling larvæ, the Blossom Weevil, and the pupæ of the Blister Moth.

The Plum.—The Plum has many pests, which also have to spend the winter in shelter (fig. 28).

On the twigs are Aphis eggs; and the eggs of Winter Moth, Vapourer, the Mottled Umber, and the Early Moth in late winter. Gall Mites lurk under the bud scales; the Brown Scale in its second stage lives upon the twigs; Tortrix eggs or larvæ are on the twigs.

In dead branches or twigs are the Bark-boring Beetles; on the larger branches are the Oyster-shell Scale and perhaps the Mussel Scale. Shot-borer Beetles bore in the branches, and the Flat-celled Borer makes its tunnels from this beetle's galleries; the Wood-Leopard and the Gnat Moth are deep in the wood.

In the moss and cracked bark lurk the Fruit Moth larva in its cocoon and the Leaf-hoppers.

On and in the soil are the pupæ of the Winter Moth, March Moth, Mottled Umber, &c.; the Leaf-eating and the Fruit-eating Saw-fly larvæ are in the soil; Weevil larvæ feed on the roots both of the trees and of other plants; in the wall near by are Leaf-hoppers, and the larvæ of the Magpie Moth and the Fruit Moth.

The Cherry.—The Cherry suffers less and has few pests; yet in winter it gives harbourage to pests of its own or of neighbouring trees (fig. 29). The Lackey eggs are on the twigs, as are those of the Winter Moth and Mottled Umber: the Case-bearer larvæ are on the twigs; in dead branches are the Bark-beetle; under bark and among cracked bark are the Bark-borer larvæ; the Gold-tail larva hides also in cracks of the bark; on suckers are the eggs of the Black-fly; in the soil are sawfly (cherry slugworm) larvæ and Leaf Weevil larvæ; the Winter Moth and Mottled Umber spend the early winter in the soil, and under any leaf-mould or manure are the Cockchafer and Garden Chafer larvæ which in summer, as beetles, feed upon the foliage.

Bush Crops.—Though orchards do not include 'plantations,' which differ technically in having bush and other crops between, I include them here as so much orchard cultivation is done on the 'plantation' system and it is more satisfactory from our point of view.

So I include the Currant, which has its own pests; if it be a Black Currant, then the Gall Mite in the buds is noticeable in winter; the Aphis eggs are on the twigs; the young of the Brown Scale are stretched out upon the buds, and the females of the Woolly Scale are on the twigs; in the shoots are the Clear-wing larvæ in their cocoons, and the Shot-borer larvæ, and stretched out on them are the Magpie larvæ, which are also on the ground and in any near-by wall or shelter.

On the roots is the currant form of the Woolly Aphis, common also to Elm and Apple.

The Gooseberry suffers from fewer pests; the Clear-wing Caterpillars are in the shoots, the Magpie larvæ are stretched out on the twigs or on the soil, or in any shelter near by; in crevices and cracks of the twigs and bark are the young of the Red Spider; in the soil are the larvæ of the three Saw-flies, as also in shelter in nail holes, in any rubbish, under stoves, &c.; in the ground also are the pupæ of the Dot Moth.

Lastly the Raspberry, often grown between Apple and Plum, with few pests, but giving shelter to many from neighbouring trees.

The Raspberry Moth Caterpillars are in cocoons on the canes or in the soil; the Byturus Beetle grubs are in the soil or at the soil level among the canes: in the cut canes are the boring Saw-fly larvæ; the Black Weevils shelter in rubbish, at the soil surface; other Weevils are in the soil as larvæ feeding on the roots.

Chafer larvæ are in the soil and perhaps pupæ of the Dot Moth and Buff Arches, which feed in summer on the foliage.

I have attempted above to show you the various insects which

attack our fruit trees, in one form only, the dormant one, in which they spend the winter. Each of these has its active form in summer, in which it feeds on the plant. I have taken this dormant form because many of them are in that form amenable to attack; they can often be checked or reduced, or totally destroyed by some simple measure which comes within our title; and I propose now to summarize the practice which experience and a knowledge of these pests show will go far towards keeping them down.

In this summary I deal not only with precautions to be taken in the winter but also in summer, and I have tried to reduce these to a simple code of principles, justifying each by reference to the pests which will be affected.

1. Clean up rubbish.
2. Have no grass.
3. Have open fences, and clean ditches.
4. Remove dead wood.
5. Cut out soft shoots.
6. Tar pruned surfaces.
7. Winter wash.
8. Control wild food-plants.
9. Maintain a summer spraying sequence.
10. Grease band.
11. Codling Moth band.
12. Collect windfalls.

1. *Clean up Rubbish.*—Many of the insects mentioned creep away and seek a shelter, either in summer, if they have finished feeding, or in winter to lie dormant. Many creep into rubbish, such as old pea-sticks, fallen leaves, leaf-mould heaps, brick rubbish and stones. (Fig. 34.) Not only do those insects sheltering over the hibernating period or over the chrysalis stage find shelter, but many a night-feeding insect that wants a secure shelter during the day.

From the Apple come the Apple-blossom Weevils seeking a winter shelter, the Leaf-miner Moths for a dry, safe place, the Lappet and the Vapourer caterpillars seeking to spin cocoons in May and June, the Gold-tail larva in winter, and the Queen Wasp in autumn, for she must find a secure winter shelter.

From Pear trees near by will come the Saw-fly larvæ, seeking to get into the soil in a secure spot where they will be undisturbed and glad of the protection of rubbish, brickbats, and the like above.

From the Plum and Gooseberry come the Magpie larvæ in autumn, to shelter among rubbish until the spring; the Early Moth turns to the chrysalis on the soil among sticks and rubbish; the Plum-fruit Caterpillar leaves the fruit in autumn and spins a delicate web between twigs or under a brick; the Leaf-hoppers bore to find shelter, and the Saw-fly larvæ burrow down into the soil. So, too, the Gooseberry Saw-fly grubs, and the larvæ of the Raspberry Moth spend the winter in concealment in some such situation.

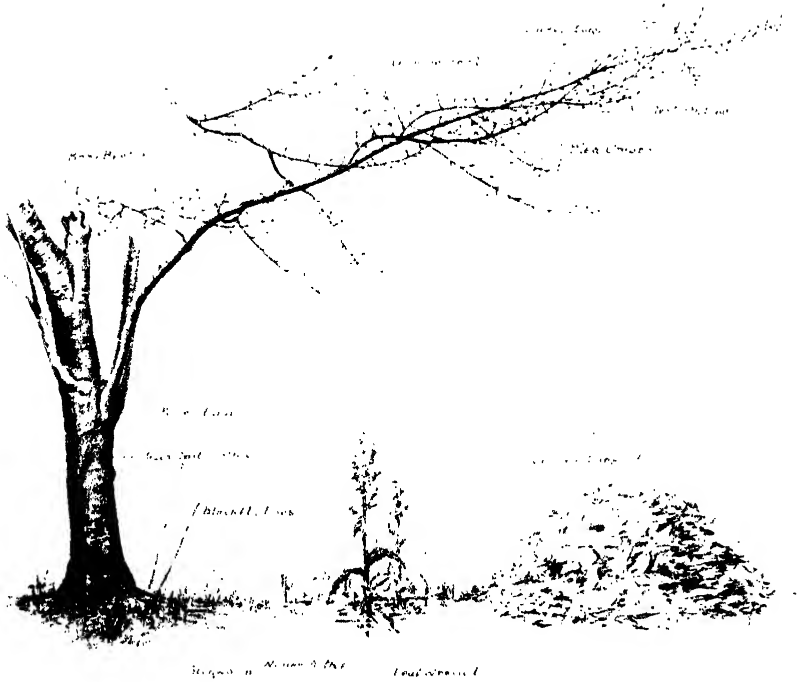

FIG. 29.—THE WINTERING OF CHERRY PESTS.

[*To face p.* [illegible]

FIG. 30.—AN APPLE-TREE WITH SOFT SAPPY GROWTHS WHICH SHOULD BE REMOVED.

Fig. 31. Shelter for Insects.
Cracks in Untarred Wound where an Apple Branch was removed.

FIG. 32.—SHELTER FOR INSECTS—A MUTILATED APPLE-TREE.

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Night-feeding forms in spring and summer must needs seek such shelter for security during daylight, and the Weevils especially welcome and profit by untidiness.

This is a hasty review of what one may find in stones, bricks, sticks, rubbish of all kinds, whether in winter or in summer; clearly it is wise not to provide such shelter and to make life more risky by removing this protection and exposing the insects to their natural enemies.

2. *Dig in Grass.*—In reviewing the pests of each tree we saw how many went to the soil for hibernation or for the chrysalis period. It is immensely to their advantage that they should be undisturbed, able to shelter themselves in cells or cocoons, and inaccessible to their enemies during this helpless time. The tillage of the soil under fruit-trees and between bushes is an important practice, and has a great influence in keeping down pests; in many English orchards grass grows under the trees, and, provided the fruit of the orchard is not the first necessity, in old orchards there is little harm; but if the orchard is primarily for fruit, of the perfect kind that sells well or stores well, permanent grass is a mistake. Many an insect coming from the tree finds at the surface of the soil among the grass stems ideal winter conditions; some go deeper and get into the soil; the Eyed Hawk chrysalis is a case in point, but it will be turned out by tillage at any time between September and April, and clearly grass prevents this. Among those that shelter on the soil in grass are the Lappet larva, which in May–June retires there to spin; the Winter Moth, March Moth, and Mottled Umber, which turn to chrysalides there for the autumn; the Apple-leaf Miner Moths shelter there; the Blossom Weevil winters safely; the Saw-fly larvæ from all trees find safety in the undisturbed soil below the grass, as do the Pear Midge larvæ; the Magpie larva hides among the grass stems, the Early Moth and Plum-fruit Moth turn to chrysalides on the soil, and Leaf-hoppers and Weevils shelter there in winter or summer. The population of the grass is considerable, whether in winter or in summer, and one can realize the extra difficulty of life to these pests if the grass is not there, but good tilled soil or a succession of crops.*

3. *Have Open Fences, Clean Drains, no Shelter Spots.*—Hedges, untidy fences, surface drains full of fallen leaves, twigs, &c., offer secure shelter to many insects, similar to those found in rubbish generally; and, where one can, it is wise to prevent this as much as possible. If there must be hedges, let them be as open as possible, especially below; the ditch should be cleared in autumn or winter, and the many sheltering insects in the rubbish removed; some shelter between loose slats in a paling, where they may get dry harbourage.

* In the discussion, Mr. Bunyard pointed out that cherries are well grown on grass. A study of the cherry pests above shows how few go to soil or grass for shelter; also cherries are sold for immediate use, and not for storage. It is less important for cherry, with its few pests, to dig grass than for any other fruit-tree.—H. M. L.

and even the loose pointing of a wall shelters some; the "shreds" used to tie branches to a garden wall shelter others. The Lappet in summer seeks shelter in which to spin, the Gold-tail in winter; the Vapourer, the Apple-leaf Miner, the Blossom Weevil, the Magpie larvæ, Saw-fly larvæ of all sorts, the Leaf-hoppers and the Weevils, are some of the commoner insects which benefit from fences, palings, and the like.

4. *Clean up Dead Wood &c.; burn Prunings.*—It is encouraging insects to leave dead or dying branches on fruit-trees; there comes the Bark Beetle (*Scolytus rugulosus*) seeking just such a breeding-place, and presently the attack extends to sound branches, which then die.

All dead trees and branches should be removed; trees often die from the attacks of Wood-Leopard or Goat-Moth larvæ: if as soon as they are dead they are removed, the larvæ or pupæ inside will be destroyed and a source of danger removed. There is a Saw-fly which hibernates in the cut raspberry canes if these are not cut short down, and when canes are cut they should be burnt, not left to shelter or to breed more pests. So, too, should prunings of all kinds, which have eggs on them and larvæ sheltering in the cracks and under bud-scales. These are, if not removed or burnt, a source of danger which a little care easily removes.

5. *Cut off Soft Shoots.*—Two pests thrive on soft shoots; the Woolly Aphis on Apple is much helped in autumn and early winter, when there is no other soft tissue; and the Grey Pear Aphis benefits by similar shoots on the Pear. If we can conveniently, it is wise to remove these shoots before the autumn is far advanced (fig. 30).

6. *Tar Pruned Branch Ends.*—When a branch is cut it heals slowly and the wood tends to crack; this offers inducements to shelter to undesirable pests if they are small enough to benefit, as for instance the Apple-leaf Miner Moth and similar pests. Tar applied at the time of pruning and renewed the following year is a valuable precaution, far more so of course from the mycologist's point of view, but still called for in view of the insects (figs. 31 to 33, and 35).

7. *Winter Wash.*—In the old English orchard the mossy trees and grey lichens are a feature of beauty, and where beauty is sought the entomologist should not be allowed in; but where fruit is desired the moss and lichen on the trunks and branches are a serious handicap, and their removal by means of a winter wash is desirable. A winter wash is a liquid too destructive to growing foliage to be applied in summer; it is put on in winter, and has three functions:

(*a*) It removes moss &c. which render inconspicuous in summer insects which would be visible on the bark and so be eaten by birds.

(*b*) It removes moss &c. which shelter many insects.

(*c*) It kills tender larvæ wintering in the bark.

For the first, moths such as the Goat Moth, the Grey Trident, the Wood-Leopard, the Codling Moth, the Bud Moth, and the Cherry-tree Borer are far less conspicuous among lichen than on clean bark, and

will stay in a "mossy" orchard when otherwise they would leave it and shelter elsewhere; these spend the day in repose, sitting on lichen &c., which their colour scheme fits in with, and it is helping them to let the lichens grow.

In the second, the lichens and moss give shelter to many tender insects; the Gold-tail larva in winter, the Currant Shoot-borer, the Codling larva, the Apple-leaf Miner Moth, the Blossom Weevils and Twig Weevils all hibernate in such a way if they can.

Removing the moss and lichen makes things harder for them.

Lastly, a winter wash may reach tender hibernating insects under the bark scales, in cracks, among the moss &c.; the young Brown-tail Caterpillars in their nests, the Gold-tail larvæ on the bark, the Currant Shoot-borer on the twigs, the young Bud Moth larvæ in their cases, the Ermine larvæ under the egg-cases, the Pith Moth larvæ under the rind near the bud are destroyed by a suitable wash applied during the dormant period. Woolly Aphis on the shoots and in the bark, the Mussel Scale under the flakes of bark, the Brown Scale, the Oyster-shell Scale, the Brown Currant Scale are sucking insects which can be checked in this way. The Gooseberry Mite and the Pear and Plum Leaf-blister Mites are hiding under the bud scales, and are killed by a suitable wash.

Winter washing is a very important operation, and is fully justified by its results. What wash to use and when is a matter largely of local conditions; what suits one district does not suit another; there are many good washes, both those sold ready for use and those that can be made up as wanted; and the application of a suitable wash should be a part of the routine in every orchard and plantation in the country.

A separate form of treatment is that known as a winter cover-wash, in which the object is to coat the tree with a wash that will remain on in the winter, will prevent moss growing, kill hibernating insects, fill up cracks, and particularly kill eggs of Apple-sucker and Aphides. The ordinary caustic winter wash probably kills very few eggs, whereas an efficient cover-wash may kill many. The Society has lately conducted a trial of winter washes, and a valuable paper on "cover-washes" has just appeared.*

8. *Control Wild Food-Plants.*—A great number of our pests are casual, live on a variety of wild plants and attack fruit-trees sporadically, and just because they happen to be there. That is the great difficulty in preventive entomology in this country; the pests are so varied, come so irregularly and are often not destructive enough for anyone to know them all or to take them seriously; but their aggregate effect is large and the total loss to the marketable crop due to these many insects is very considerable. I have no figures available, but I really wonder if we do harvest in a perfect marketable condition more than one-third or a half of the fruit that the trees yield.

* *See* Lees, *Ann. App. Biol.* I. p. 351.

One of the greatest factors in the control of these pests is their wild food-plants; clearly it is folly to have, near the orchard, trees on which live insects capable of attacking fruit-trees and which will do so when they are abundant. The Hawthorn, for instance, is a food-plant of the Lappet Moth, Brown-tail, Gold-tail, Lackey, December Moth, Figure of 8, Vapourer, March Moth, Clouded Drab, Ermine (Plum and Cherry species), Apple Aphis, Rosy Apple Aphis, Woolly Aphis, Mussel Scale, Brown Scale, Magpie Moth, Pear Leaf-blister Moth, Early Moth, Shot-borer Beetle, Plum-leaf Saw-fly, Cherry Fruit Moth. That is, twenty-one species that attack fruit-trees feed on Hawthorn. Many of these attack fruit-trees only when abundant on Hawthorn, passing from it to the fruit.

In an appendix, a list of food-plants tabulates the most important wild trees which are common to our pests. It is desirable, as far as possible, not to grow these as hedges for orchards or quite near to them; the most important are Hawthorn, Sloe, Willow, Sallow, Poplar, Oak, Cotoneaster, Rose. If one grows ornamental crabs or cherries near an orchard or as part of it they must of course be treated just as the fruit-trees; so with Hawthorn hedges, they should be treated just as the orchard is, and the pests kept under; as a rule this is not done because the danger is not recognized.

9. *A Summer Spraying Sequence.*—It is perhaps striving for an ideal to suggest a spraying sequence in summer, but already much summer spraying is done for individual pests such as Aphis or Apple-sucker, and the serious fruit-grower would probably do well to try to spray in such a way as to cover as many pests as possible.

It is a good policy to spray for a pest such as Apple-sucker, when it is serious, without thinking of any other pest; *i.e.*, if you want to kill Apple-sucker, think of it only, spray with the best thing and at the proper time, and destroy it utterly. So, too, for Woolly Aphis or Mussel Scale. But where an orchard is not suffering from any one pest particularly, can one by summer spraying generally do any good?

This depends wholly upon the mixture of trees grown; where Apple only is grown a sequence is easily arrived at; where, as in Middlesex, half Plum and half Apple and Pear mixed, with bush fruit, is a common practice, the ideal spraying sequence becomes very difficult.

I have not a long enough experience of this country to suggest any definite sequence in mixed orchards, but I may offer some ideas which help towards establishing such a sequence.

For Apple, under the conditions I am familiar with, four sprayings are desirable.

1. Early spraying with an Apple-sucker wash, which also kills early Aphides. This is usually done in April, perhaps earlier.

2. Spray with lead chromate as soon as the foliage is formed.

3. Spray with a contact poison in June; if Mussel Scale is present use a strong wash and apply to the trunk as well as to the foliage.

4. Spray again with a strong contact poison in September, for

Brown Scale, Mussel Scale, Woolly Aphis, young caterpillars such as Bud Moth, Ermine, Lappet, &c.

For Pear:

1. Lead chromate as soon as the foliage is formed.
2. Contact poison if required for Thrips, Aphis, or Blister Mite.

For Plum:

1. Lead chromate as soon as foliage is formed.
2. Contact poison for Leaf-curling Aphis directly it is seen. If strong enough this kills Leaf-hoppers and the young Oyster-shell Scale.

For Cherry:

1. Lead chromate, as soon as foliage is formed.
2. Contact poison in autumn if Black Fly is seen. This also checks Leaf-hoppers.

For Currant:

1. Sulphur and contact poison for Gall Mite in May.
2. Lead chromate when foliage is formed.
3. Contact poison in June, July, or August, if Aphides, White Scale, or Brown Scale are found.

For Gooseberry:

1. Lead chromate as soon as the foliage is out.
2. Sulphur and contact poison if Red Spider appears in April or May.

The above seem to me to be the sprayings one would think of applying. Lead chromate, properly made up, is a wash that remains on the foliage the whole year, that makes it distasteful to all biting insects (Caterpillars, Saw-flies, Weevils), and that keeps the foliage immune from all this class of attack. It has, I believe, special value in England as a protective wash, and I know of no other that resists rain so well.

It is not enough simply to put on lead chromate and water; this will not "wet" the leaves; one requires to add soap or some wetting ingredient.

If Codling Moth is a serious pest, one must spray separately for it between the time the blossom falls and the calyx closes; and it is a mistake to spray Apples and leave Pears, as the latter then suffer heavily. In this spraying lead arseniate is generally used, but lead chromate is probably more effective.

By "contact" wash spraying, I mean one of the many washes for Aphides &c. which do not poison their food but kill by coming in contact with the body of the insect. The many oil, quassia, soap, and similar preparations are so used, and they can be easily made up or purchased ready to mix.

One should ascertain the effect. In one case which came under my notice last year, a grower was using a wash costing him 10*s.* 6*d.* the 100 gallons to make up, which was found to be killing 38 per cent. of his Apple-suckers, while there are washes costing 2*s.* 6*d.* the 100 gallons which will kill 100 per cent. every time. Special contact poisons are required for Woolly Aphis and for Red Spider.

It is impossible to say more at this time about spraying and

insecticides; the important thing is to arrive at a definite plan of operations for summer spraying as a regular practice, and for each orchard this must depend upon the circumstances.

10. *Grease-banding.*—The practice of tying grease-proof paper on the trunks of fruit trees and treating them with grease is well known and generally practised where Winter Moth and its allies are abundant. It is important to use a grease-proof paper and a grease that remains sticky.

11. *Codling Moth Banding.*—Where Codling Moth is abundant, many may be trapped by tying bands of cloth or sacking round the trunks after July; the caterpillars, as they seek shelter for the winter, get into the band and can be destroyed.

12. *Clear up "Windfalls."*—Many apples and pears affected with Codling Moth fall early, and if not picked up or removed the Codling larva leaves the fruit and gets to shelter. Not all windfalls are due to insects, but many are. In some of the Dominions legislation has made the daily picking up of windfalls compulsory.

The above are the recommendations one would suggest as effective for keeping orchards clear of pests. You may have a nightmare vision of an orchard as a place full of lurking insects ready to leap out of their hiding-places, and you may wonder why you ever get any fruit; but if you will, when the fruit is picked, ascertain exactly what percentage is bad, what percentage slightly damaged so that they will not keep, and what percentage perfectly sound, I think you will agree that I have not overdrawn the picture, and that some such code of rules should be in force in the business orchard.

Cleanliness, clean cultivation, is the essence of horticulture; to grow what you want and nothing else, to give all the good of the soil, all the sunlight, the air, and the rain to the plants you want, to maturing fruit for your use, that is the essence of success in a business in which you set out to get every fruit that the land will produce in a perfect marketable condition and without blemish.

[My thanks are due to Miss Reid for drawings, to Mr. Malby and Mr. Westrop for beautiful slides, to Messrs. W. Cooper and Nephews for permission to use unpublished slides. The text includes information gathered from the writings of Professor Theobald, Miss Ormerod, Mr. Warburton, and others.]

APPENDIX.

Fruit Pests and their Food-Plants.

Brown-tail Moth.—Apple, pear, plum, oak, elm, sloe, hawthorn.

Gold-tail Moth.—Apple, pear, plum, oak, cherry, sallow, birch, beech, hawthorn, nut, rose.

Lackey Moth.—Apple, pear, plum, hawthorn, oak, elm, rose.

March Moth.—Apple, plum, hawthorn, sloe, oak, lime, elm, maple, walnut.

Mottled Umber Moth.—Apple, pear, plum, cherry, cob, filbert, oak, birch, honeysuckle, rose.

WINTER MOTH.—Apple, pear, plum, cherry, oak.

VAPOURER MOTH.—Apple, pear, plum, damson, hawthorn, sloe, rose, Wistaria.

WOOD-LEOPARD MOTH.—Apple, pear, plum, walnut, chestnut.

BUD MOTH.—Apple, plum, cherry, peach, quince, sloe, blackberry.

ERMINE MOTH (*variabilis*).—Pear, plum, hawthorn, cherry.

PEAR LEAF-BLISTER MOTH.—Pear, apple, hawthorn.

EYED HAWK MOTH.—Apple, willow, sallow, poplar, almond, sloe, peach.

LAPPET MOTH.—Apple, pear, plum, hawthorn, sloe, willow, sallow.

DECEMBER MOTH.—Apple, poplar, elder, lime, ash, oak, aspen, elm, hawthorn, birch, sallow.

FIGURE-OF-EIGHT MOTH.—Apple, plum, cherry, hawthorn, sloe, crab.

PEPPER-AND-SALT MOTH.—Apple, cherry, hawthorn, oak, elm, poplar, birch.

CLOUDED DRAB.—Apple, sloe, willow, oak, elm, lime.

ALLIED BUD MOTH.—Apple, pear, sloe, hawthorn.

PLUM TORTRIX.—Apple, cherry, plum, nut, sloe, bullace.

PLUM FRUIT MOTH.—Plum, damson, sloe, bullace.

EARLY MOTH.—Plum, hawthorn, sloe.

CHERRY-TREE BORER.—Cherry, plum, apple, nectarine, peach.

LARGE TORTOISE-SHELL BUTTERFLY.—Apple, pear, cherry, sallow, osier, aspen, elm.

MAGPIE MOTH.—Currant, plum, hazel, sloe, hawthorn, maple, spindle.

BARK BEETLE.—Apple, pear, plum, peach, plum, apricot, nectarine, quince.

APPLE APHIS.—Apple, pear, crab, quince, hawthorn.

ROSY APPLE APHIS.—Apple, pear, hawthorn, *Sorbus*.

WOOLLY APHIS.—Apple, *Cotoneaster*, hawthorn, *Pyrus* sp., ? elm, ? currant.

MUSSEL SCALE.—Apple, pear, heather, broom, elm, willow, furze, hawthorn, sallow, currant, mountain ash, sloe.

BROWN APPLE SCALE.—Apple, willow, linden, poplar, *Pyrus*, hawthorn, elm, *Cotoneaster*, sycamore, oak, alder, rose, laurel, sloe, spindle-tree.

PLUM-LEAF APHIS.—Plum, peach, apricot, apple.

OYSTER-SHELL SCALE.—Plum, apple, pear, cherry, currant, heather.

BROWN CURRANT SCALE.—Currant, gooseberry, *Cotoneaster*.

SOCIAL PEAR SAW-FLY.—Pear, cherry, plum, hawthorn, medlar.

PEAR AND CHERRY SAW-FLY.—Pear, cherry, quince, plum, mountain ash, birch, oak, almond, blackberry.

PLUM-LEAF SAW-FLY.—Plum, pear, rose, hawthorn, bramble, mountain ash, birch, sloe, bullace.

FLAT-CELLED BORER.—Plum, pear, apple, poplar, lime, plane, birch, alder, elm, beech, oak, larch, pine.

SHOT-BORER.—Plum, pear, apple, peach, oak, beech, rose, fir, *Thuja*, chestnut, vine, maple, alder, hawthorn, elm.

ON PRESSING FLOWERS TO RETAIN THEIR COLOURS.

By Dr. Claud F. Fothergill.

[Read March 2, 1915; Dr. F. Keeble, F.R.S., in the Chair.]

When I was a boy at school two prizes were offered by the late Dr. F. G. Smart, open to the whole school, for the best collections of pressed flowers made during certain summer holidays. I am sure there are many to whom Dr. Smart's name is familiar, for he was later the founder of a Botanical Studentship at my old University, Cambridge, and in many other ways showed great interest in Natural History. I entered for this prize with great keenness and proved successful in winning second prize, having pressed my flowers between blotting-paper and boards.

I learnt, to my no small disgust, that I only missed the first prize as I had named my flowers with English names and not with the Latin ones. However, I look back to that summer as the time when I first became so truly appreciative of flowers that it gave me real pleasure to find this one or that, and see it in its natural habitat; in fact I learnt then the pleasure of so appreciating a flower as to regret picking it, which is perhaps the highest test of one's love for wild flowers. The interest aroused then has never left me, and this hobby has made innumerable walks and excursions in Switzerland, Tyrol, and our own country doubly pleasant.

If I may be allowed to digress here for a moment I would like humbly to suggest that our Society organize a Pressed Flower Exhibition of wild and cultivated flowers, and that the majority of the prizes offered be for competition amongst young people up to twenty years of age. I venture to think that such an exhibition would stir up a surprising amount of interest.

I have tried to press and preserve flowers by a variety of methods—in blotting-paper between boards, in sand, in ivory dust, &c., using or not using preservatives of one kind or another. I found every one of these methods unsuccessful, producing in most cases a brown, uninteresting result, quite unlike the original in colour.

My father and I made various experiments and finally hit upon my present method of employing absorbent cotton-wool placed in three layers, forming two compartments, between two grids, so to say, consisting of a wire meshwork with half-inch squares, rather more or less, with a heavy encircling band. The necessary pressure is obtained by fastening one or two straps, preferably of webbing, around the grids and tightening them as required.

The flowers to be pressed and dried are placed between the layers of cotton-wool; more than three layers should not be used, otherwise insufficient heat and air reach the flowers, and the drying being delayed a bad result is obtained. The whole press, consisting of cotton-wool containing the flowers, the two grids, and encircling straps,

is suspended in front of a hot fire, or when the weather is fine out of doors in the air, in the hottest possible sun.

The success of the method is due to the process of drying being so rapid that the pigment is fixed instead of being slowly decomposed. By the old blotting-paper and boards method it took some four to six weeks before the dried specimen was obtained, and involved the laborious work of changing and drying the blotting-paper, and naturally the pigment had slowly decayed meanwhile.

By my method primroses picked from off the living plant can be permanently dried to retain a lifelike colour in two hours, if the press containing them is placed in the oven. Fresh carnations can be permanently dried in seven hours, and most flowers take less time in the oven or rather more in front of a hot fire or out of doors in the sun. Few flowers take longer than two or three days in bright sun. Some flowers and leaves have a waxy covering and take longer to dry, but they are in the minority.

The method is extremely simple, for once placed in the press nothing need be done to the flowers again until they are dry, and then there is nothing more to do than remove them from the press.

When placing the flower in the press, care should be taken to see that petals and leaves are not bent over. I find it a good thing to cut the heads of flowers off the stalks whilst being pressed, as they lie flatter, and they can always be mounted together afterwards. Little pledgets of cotton-wool should be placed between the petals where they are in contact with one another, otherwise sweating will occur and the colour will be destroyed or spoilt. Flowers like Canterbury bells or foxgloves or the bell gentian should be stuffed with a little cotton-wool; this stuffing is best carried out with the help of small dissecting forceps. The flowers may be considered sufficiently dry when, on taking them out of the press and holding them up, they support their own weight, or when they have become brittle.

If the flowers are mounted afterwards, preferably no gum should be employed, or at the most a minimal amount, as the damp out of it may destroy the pigment. The flowers can easily be mounted with small narrow slips of stamp paper, or a philatelist's stamp hinge may be used at the back of the flower. The mounted specimens should be kept in a dry place.

The best results are obtained if the flower is placed in the press immediately after it is picked; if this is impossible it is better to revive it in water for some hours and then press it rather than endeavour to press it when drooping. The flowers should be dry when placed in the press, and not wet either with dew or rain. If they have been placed in water the stalks can be carefully dried with a soft handkerchief.

I think also that flowers picked in the morning give better results than those picked later in the day.

May I in conclusion say, to save myself unnecessary correspondence, that the patented press now being sold by the trade as the Fothergill Flower Press is not obtainable from myself?

CHANGES OF COLOUR AND STRUCTURE OF FLOWERS BY REMOVING SUNLIGHT AT SELECTED HOURS.*

By Col. H. E. RAWSON, C.B., R.E. (*ret.*).

[Read March 2, 1915; Dr. F. KEEBLE, F.R.S., in the Chair.]

IT is owing to Dr. FOTHERGILL'S method of pressing flowers in such a way as to retain the colours, that I am able to show you for the first time, not photographs, but the actual flowers whose colours have been changed by removing full sun from the plants at selected hours of the day, while interfering as little as possible with the diffuse light at any hour. The way this has been done artificially is described in the Reports of the British Association for 1908 and 1913; but such screening can be observed every day, by the posts and shelving of conservatories, the walls of open gardens, and by natural woods, hills, hedges, and rocks. Any opaque screen has proved to be sufficient, and whether it is set at an angle overhead or placed vertically between the sun and the plant, it need never interfere with the rainfall or the diffuse light. These experiments have extended over the last nine years, and I much regret that Dr. FOTHERGILL'S flower-presses were not perfected earlier, when I should have been able to show you all the changes of colour and structure effected by the action of sunlight, from the time they first occurred; for, as you will see, the flowers can be mounted on cardboard so as to appear as if they had just been picked, and dates and notes can be added on the margin. I have tried painting the flowers, and even doing so with their own pigments, photographing them in colours, and preserving them in sand; but the results have been open to suspicion and unsatisfactory. I cannot express too highly my appreciation of Dr. FOTHERGILL'S process, and even where much skill is required to retain the exact hues of a red flower, for instance, this very fact is of scientific interest.

While I am not able to show you all the various stages, as they arose, of such a change as from yellow to purple or from orange to chocolate, I can show you the flowers as they now appear in an open garden. Here is a series of twelve of each kind. They are those of *Tropaeolum majus*, the common garden Nasturtium, and the purple variety was obtained from the ordinary orange and scarlet varieties, twelve of which were growing in a clump in a garden at Pretoria, and were all changed, with one exception, in less than three years, by a South African sun, screened by one of the walls of the house and a belt of trees over 100 feet away. Their seeds and that of the one exception were brought to England and treated as nearly as possible in the same

* The lecture was illustrated by specimens.

way, and flowers of this colour are now obtained from all parts of the garden in profusion. The complete change of the exceptional plant was also effected. Here, as in the case of Miss Jekyll's Iceland Poppies, there can be no question of cross-fertilization, for no purple variety of Nasturtium was known in the neighbourhood of Pretoria, and the plants excited much interest when they were publicly exhibited. The carefully carried out experiment could have only one explanation, and it lay in the *kind* of sunlight which fell upon these plants when they were fully exposed. We are irresistibly led to think of the many historic cases—and naturally that of the Shirley Poppy, in which we feel such a personal interest—where new species and new varieties have been found, in the first instance, in some one spot and in no other, in such circumstances that we cannot but believe that they originated *there*. You see in the instances before you that under the sun's action the so-called honey-guides will disappear, spots and markings will be modified, and the colours so changed that gardeners will be ready to admit that they have not seen such varieties before.

By leading a main axis through a board overhead, and branches through other boards at the side and at the back, the same plant has been subjected in different regions to sunlight of different kinds. The seed was allowed to drop, and was not screened artificially in any way the next year. New varieties, never seen before in these experiments, were obtained, and amongst them one that is well known to gardeners as 'Aurora,' in which flowers of very different colours are borne simultaneously. The appearance of these multicoloured flowers marks a distinct stage in these experiments. They are of interest to the botanist as indicating the inherent potentialities waiting to be stimulated by sunlight, and to the practical gardener as the source to which he may look for many new and pleasing colour-modifications when once we learn how to control them. I have here several examples of them, and you will see that in some cases the same flowers appear, at adjoining or adjacent nodes, as are seen in the series of changes from yellow to purple or from orange to chocolate, thus enabling us to draw some very instructive conclusions regarding colouring matters. All the multicoloured varieties arose in the first instance from screening different regions of a plant so that full sun fell on them at different times. The modifications then produced were found to be transmitted by the seed under the same conditions of sunlight.

From the commencement of these experiments each plant under observation has had its separate page in the diary, and as the value of any modification could not be anticipated the minutest detail was entered. No pot was ever moved, except designedly, even one inch from its assigned position, nor was it rotated on its axis. It soon became apparent that the three colours—yellow, red, and purple—were associated with distinct altitudes of the sun as it moved from sunrise to sunset. If a plant was given full sun at a low altitude any yellow pigment in the flower was intensified, while purples could only be produced by the sun at its highest altitudes—such as we experience in summer—and reds

at the intermediate altitudes. Expressing this result—which I believe to hold for a large number of flowers—in a rough and ready way, it may be said that Low Sun promotes yellows, Middle Sun reds, and High Sun purples, in our latitudes and climate. And this has been found to be true for seasonal as well as diurnal colour-changes. Here are many specimens illustrating this, and you can see that removing middle and high sun from a flower in summer increases the yellow colour in the same way as low sun does in autumn or early spring. I shall not enter into the question now whether this is due to the yellow pigment being formed or only unmasked. For the first four years of these experiments with Nasturtiums, only South African seed was used, but it was then thought desirable to introduce some seed from Scotland for comparison.* Proliferation, such as could be seen in the flower exhibited, of the Rose 'Carmine Pillar,' and believed to have been entirely due to sunlight, was the first important phenomenon to take place in the Nasturtiums under the stimulus of sunlight. It appeared simultaneously in three plants, two of which were grown from South African and one from Scotch seed. It was also a Scotch plant which showed the first great structural change associated with a change of colour when the flower developed three spurs instead of one. This occurred in 1912; and it has now become so common that such flowers are to be found in any aspect, without any artificial screening. Here are several specimens out of over sixty which occurred in the open garden in 1914. You will see that many important structural alterations accompany this growth. The number of petals varies, and instead of the usual two sessile and three unguiculate petals, four out of the five may be sessile, or the number may be increased to six—all of which may be sessile. In cases like the last, the margins of the petals sometimes adhere; and when such a flower has three spurs, as you see this one has, we are instinctively reminded of the *Aquilegia*, which belongs to another order, the Ranunculaceae. I would draw your attention to these unusual coloured parallel veins in the unguiculate petals, which are found to denote that the petal is nearly sessile in character. It is significant of what is going on at the base of the lamina. You will notice also that with these changes the subtending leaves disappear from the nodes, and the growth at the internodes is so abnormal that six and seven flowers will spring together, like an umbel, from a lateral shoot not an inch long, or from the same length of the axis itself. The whole plant appears to be affected. Are we here approaching the inflorescence of the Geraniaceae? There are numerous cases of fasciation of the spur, and as many as four have been found adhering laterally. The experiments have lasted too

* This was the first outside seed admitted into the same garden as the experiments, and by this time the changes of colour with sun's altitude were unquestionable. Seeds are either sown in boxes and the plants bedded out, or they are sown in paper bags, with specially sifted earth, in the beds they are to occupy. By preventing any possible mixture of seed from individual plants, any sudden change of colour in the petals or of growth in an organism was detected. When the lessons learnt with the Pretoria seed were applied to that obtained from Scotland the same results followed.

short a time to obtain a plant with all its flowers multi-spurred, but already whole branches have been found with all the flowers structurally altered in this way. It appears that if the same sunlight is removed for three years a character of this kind can be fixed. The exact insolation for producing multi-spurred flowers has been ascertained with considerable precision. When it was applied to a plant of *Tropaeolum tuberosum*, with a view to obtaining such flowers, they sported at once, and I am able to show you one of the 2-spurred flowers. Changes in the number and form of the petals occurred, you see, as well; but, what was still more remarkable, the plant was then found to have no subterranean tubers. It was potted and taken into the conservatory for the winter, and *aerial tubers* began shortly to grow on the stems. The experiment was repeated last summer, and I have brought this plant for you to see the two aerial tubers growing from nodes three or four inches above the surface of the ground (fig. 36). The plant of the previous year grew luxuriant stems from its aerial tubers, and there are at the present moment fifteen aerial tubers on these new stems. I am not without hopes that sunlight will be able to convert *T. majus* into *T. tuberosum*, for I am already able to show you how the entire leaf of the former has become deeply dentated so as to approximate to the leaves of the latter.

My specimens illustrate several other changes which have been produced in Tropæolum flowers, but I will only draw your attention to one, which has been repeated a second time last year in the open garden. Two blooms were produced together on a single peduncle so as to unite into one flower-head, with a whorl of eight petals—a form of fasciation recognized under the name of synanthy.

You may wish for a suggestion as to how the solar radiation at different altitudes of the sun can effect such changes as these. I suggest that they are traceable to the fact that rays of different wave-length are not of the same efficiency in carbon-assimilation or in the formation of chlorophyll. In the course of the day the absorption by the atmosphere is always found to vary considerably; it sifts out at some hours those rays which it allows to pass freely at others. It is not difficult to understand that such a system of screening as has been described must interfere with metabolism, and by affecting the actual formation of chlorophyll itself the transmission of the sun's energy to the protoplasm must be subject to abnormal variations. Not only Nasturtiums, but Dahlias, Poppies, Godetias, Chrysanthemums, and Tomatos have been experimented upon, and have been proved to be sensitive to the removal of sunlight in this way. By attending to the connexion which seems to exist between aspect and colour, the quantity of fruit obtained from the Yellow Tomato has been much increased on two occasions.

Flowers of *Tropaeolum majus* with two spurs were found and described to the Botanical Society of Edinburgh in 1860, and variations in the number and shape of the petals are far from uncommon. Proliferation is often observed in various kinds of flowers, and it is by

no means rare to find tubers growing aerially instead of below the ground. I have not, however, met with records of Tropæolum flowers with three and four spurs. I may remind you that when *Linaria vulgaris* was first found in 1742 with five spurs, the variation was thought so marvellous that the word "*peloria*" (miracle) was introduced into botany to express it. None of the specimens you have seen to-day may be new, but the essence of these experiments lies in the fact that we now know what can give rise to such variations, and we can reproduce them at will by means of natural forces and phenomena.

THE PASSING OF DARWINISM.

By Rev. Prof. G. HENSLOW, M.A., F.L.S., V.M.H. &c.

[Read March 16, 1915; Dr. F. KEEBLE, F.R.S., in the Chair.]

Introduction.—Darwinism, or the Theory of the Origin of Species by means of Natural Selection, has held its ground for fifty-five years. But it is destined to pass away; though the "struggle for existence" with the "survival of the fittest" upon which the theory was based will continue, presumably, amongst living organisms, as long as the world shall exist. The theory itself cannot last, though Evolution is now based on far securer grounds than DARWIN could realize in the fifties. It is established on a vast amount of induction and experimental verification; but the origination of varieties and species has nothing to do with either the struggle for existence or natural selection, for organisms create their own adaptive variations of structure by responding directly to changed conditions of life.

Mr. BATESON said in his address, as President of the British Association at the meeting held at Melbourne (1914):—"We have come to the conviction that the principle of 'natural selection' cannot have been the chief factor in delimiting the species of animals and plants. . . . We are even more sceptical as to the validity of that appeal to changes in the conditions of life, as direct causes of modification, upon which latterly, at all events, Darwin laid much emphasis."

My object in this lecture is to show that as far as the first part of this quotation is concerned Mr. BATESON is right; but with the second he has no grounds for being sceptical, as I shall prove in this and my next lecture.

What, then, does "Darwinism" mean? It is a word expressing Darwin's theory, called "The Origin of Species by means of Natural Selection," the title of his book published in 1859.

Let us briefly trace the progress in DARWIN'S mind, and see how the *theory* arose to account for the "transmutation of species" through "delimitation" (not their "origin") by means of "natural selection."

1833–1837, *Origin of the Idea of "Transmutation of Species."*—DARWIN'S first conception of the origin of species by "transmutation" arose in his mind in 1835 when he visited the Galapagos Archipelago, situated in the Pacific Ocean, near the Equator, about 550 miles or so from South America. He had made a previous discovery of gigantic fossils in South America, when at Bahia Blanca in 1833; which, though now extinct and of enormous size, are represented at the present day by the small Sloth, the Armadillo, and the Ant-eater, of the same family. In the Galapagos Islands he discovered the existing plants and animals to be of the same genera as those of South America; but the

species were peculiar to *each* island respectively. So that while the fossils differed in course of time, the species differ in space. Speaking of the shells, DARWIN says :—" At the Galapagos Islands we have a halting-place (between the east and west) where many new forms have been created " * ; and he asks " Why were the vast majority of all the land animals, and more than half of the flowering plants, which are aboriginal productions, created on American types of organization ? "† No one doubted "immediate" creation before he left England.

This question is the first indication of any doubt as to the method of origin which appears to have passed through his mind.

DARWIN could not fail to see that the various kinds were *adapted* to their places, severally.

A hint as to " adaptations " appears in a remark about the blindness of the Tucutuco,‡ an animal burrowing like a mole. "Lamarck would have been delighted with this fact, had he known of it, when speculating (probably with more truth than usual with him) [another hint of a growing belief in Evolution ?] on the gradually-*acquired* blindness of the Aspalax, a gnawer living underground, and of the Proteus [a reptile living in dark caverns], of which animals the eye is in an almost rudimentary state."

Writing subsequently in 1842, he says :—" I had been greatly struck with the characters of the South American fossils and of species in the Galapagos Archipelago These facts were the origin of all my views § . . . But I did not become convinced that species were mutable until, I think, two or three years had elapsed." ||

In 1836 DARWIN returned to England.

1838. *Darwin read Malthus' Essay on Population.*¶—" Being well prepared to appreciate the struggle for existence, which everywhere goes on, from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved [*i e.* by delimitation] and unfavourable ** ones to be destroyed. The result of this would be the formation of new species. Here, then, I had at last got a theory by which to work. . . . [Now follows a very important statement] But at that time I overlooked one problem of great importance . . . the tendency in organic beings descended from the same stock to

* *Naturalist's Voyage*, p 391

† *Op. cit.* p. 393

‡ *Op. cit.* pp. 50, 52 (*Ctenomys brasiliensis*).

§ *Foundations*, p. xii (1842)

|| *Op. cit.* p. xiii

¶ Malthus' object was to investigate the causes of the limitation of population in an isolated area, where the production of food would be limited, but the population would increase indefinitely. Therefore there would be a limit to the means of living Consequently *starvation* and *diseases* would be the chief causes of depopulation

Among a batch of seedlings, starvation accounts for the majority—though all are perfectly healthy—being overcrowded and so perishing. Darwin calls this " fortuitous " destruction.

** This word, or " injurious " (in the *Origin*), is the fatal mistake in the theory, by which it falls ; such variations *never* occur

Fig. 33.—Shelter for Insects. Cracks in bark of Pear-tree

[To face p. 48.

FIG. 34.—SHELTER FOR INSECTS. OLD PEA-STICKS IN AN UNTIDY GARDEN.

FIG. 35.—SHELTER FOR INSECTS.—A BADLY TREATED APPLE-TREE.

FIG. 36.—TROPAEOLUM TUBEROSUM, PRODUCING AERIAL TUBERS.

[To face p. 40.

diverge in character as they become modified [*i.e.* by definite variation] . . . so as to be classifiable as 'families, genera and species, &c.'

"The solution, as I believe, is that the modified offspring of all dominant and increasing forms *tend to become adapted* [my italics] to many and highly diversified places in the economy of Nature." *

But this "tendency" requires stimulation. What happens is that the descendants get dispersed into various conditions of life, so that each varies again by self-adaptation in response to the direct action of the environments; consequently different *varieties* or *species* arise, all, collectively, making a *genus*.

This was a "problem" DARWIN said he had previously overlooked, but does not say when it occurred to him; all he remarks is: "I can remember the very spot in the road, when, to my joy, the solution occurred to me; and this was long after I had come to Down." † (1842.) In what year was it? I would suggest about 1864.

The words "tend to become adapted," therefore, correspond to the present-day expression "responds to the direct action of changed conditions of life." "Adaptations" are due to the directivity of life. He herein gives us his two alternatives, which are mutually exclusive. ‡

It is remarkable that we read nothing more about "adaptation" in the "Origin &c." 1st to 6th eds., nor in the "Variation &c." The word does not occur in the index of either. "Adaptations" are the result of this "tendency to respond"; but DARWIN unfortunately seems not to have studied or experimented with wild plants, for had he done so he could not have written the following sentence: "Even with modifications resulting from the definite action of the conditions of life, § when all or nearly all the individuals which have been similarly exposed are similarly affected we can rarely see the precise relation between cause and effect." || My experiments have taught me the exact reverse; the most profound changes, internal and external, are *immediate* and *obvious* at once. ¶

"My first note-book," DARWIN says, "was opened in July 1837, and without any theory I collected facts on a wholesale scale, more especially with respect to domesticated productions. . . . I soon perceived that *Selection* was the keystone of man's success in making [?] useful races of animals and plants. But how selection could be applied to organisms living in a state of nature remained for some time a mystery to me." **

Variability and Natural Selection.—The following are Darwin's words when defining his famous theory; it may be called the *locus classicus* of Natural Selection: "Can we doubt (remembering that

* *Life* &c. p. 84.
† *Op. cit.* p. 82.
‡ The theory of natural selection, we shall see, entirely excludes all "tendency to adaptation"; if adaptations arise they are by "accident." (See below.)
§ *Variation* &c. ii. p. 271.
|| *Op. cit.* ii. p. 292.
¶ I would refer the reader to my books: *The Origin of Plant Structures*, *The Heredity of Acquired Characters in Plants*, and papers in the *Jour. Linn. Soc.*
** *Life* &c. i. p. 83.

many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving? On the other hand, we may feel sure that *any variation in the least degree injurious* would be rigidly destroyed. This preservation of favourable individual differences and variations, and the destruction of those which are injurious, I have called Natural Selection." *

I have italicized the expression, upon the truth of which the theory stands or falls; for by "injurious" we learn elsewhere that he means "inadaptive." I say, at once, *no instance is known among seedlings of any injurious variations of structure arising.* For all variations take place between germination and the adult stage of seed-bearing.

The Origin of Variations.—Why do new structural variations ever arise at all? The following is DARWIN'S statement of their cause, which Prof. BATESON hesitates to accept: "The direct action of the [changed] conditions of life, whether leading to *definite* [*i.e.* adaptive] or *indefinite* [*i.e.* inadaptive] results, is a totally distinct consideration from the effects of natural selection; for natural selection depends on the survival under various and complex circumstances of the best-fitted individuals; but it has no relation whatever to the primary cause of any modification of structure." †

"By the term definite action, I mean an action of such a nature that, when many individuals of the same variety are exposed to any change in their physical conditions of life, all, or nearly all the individuals, are modified in the same manner. A new sub-variety would thus be produced without the aid of selection." ‡

It could not be stated plainer that the "cause" of variations is the *direct action* of changed conditions of life; and that "natural selection" stands, theoretically, for what Prof. BATESON calls the "delimitation" of varieties and species.

The *title* of DARWIN'S book is, therefore, *misleading*; for it has induced some writers § to regard natural selection as the actual *cause* of new species. The word "origin" should mean "origination"; but with this natural selection has nothing in common.

The starting-point of Evolution resides in the inherent variability ‖ of animals and plants, *i.e.* the power or ability to vary, while the cultivation of plants and the domestication of animals have shown this to be true in various degrees; as some plants and animals, such as wheat and horses, &c., have produced numerous varieties; whereas others have given rise to a few or none, as the ass and goose, the raspberry and currant, the stock and wallflower.

When we turn to Nature, we do not find this profusion of indefinite variations springing up about the parent plants, as in the plant-beds of nurseries.

* *Origin* &c. 6th ed. p. 63.
† *Variation* &c. ii. p. 272.
‡ *Op. cit.* ii. p. 271.
§ *Op. cit.* ii. p. 272.
‖ Darwin often uses the word "variability" to mean "variations."

DARWIN studied plants and animals—not in the wild state—where species *only arise*, but under cultivation and domestication, where varieties *only appear*; and he perceived that when wild organisms are brought under the skill of man they soon vary, as a rule, from the original forms, generally in many ways; *e.g.* the numerous kinds of the cabbage tribe, which has no varieties in the wild state. This is indefinite variation.

Materials for Natural Selection.—The materials upon which natural selection was supposed to act in wild plants were the so-called "individual differences." DARWIN thus describes them: "The many slight differences which appear in the offspring from the same parents . . . may be called 'individual differences' . . . These are of the highest importance for us, for they are often inherited, and they thus afford materials for natural selection to act on and accumulate." *

But, if we apply DARWIN's definition of Natural Selection, it requires the assumption that the *majority* of the individuals must have "injurious," *i.e.* "inadaptive variations," which cause the death of their bearers. Such is not the case. Individual differences are due to the fact that growth and development are not mathematically exact and the same in every individual. No two peas in a pod are *absolutely* alike, nor two leaves on a tree. The differences are merely trivial and of no account to the plant, and never *mortal*. Nor are they of importance, as a rule, to the systematic botanist, who merely adds "very variable" if necessary.

Darwin's Metaphor of a "noble and commodious edifice."—Darwin has given us an imaginary illustration. It may be described as a parable of the process of natural selection, making it quite clear as to his meaning of "indefinite" variations. He says: "If an architect were to rear a noble and commodious edifice, without the use of cut stone [or mortar], by selecting from the fragments at the base of a precipice wedge-formed stones for his arches, elongated stones for his lintels, and flat stones for his roof, we should admire his skill and regard him as the paramount power. Now, the fragments of stone, though indispensable to the architect, bear to the edifice built by him the same relation which the fluctuating variations of each organic being bear to the varied and admirable structures ultimately acquired by its modified descendants. . . . The shape of the fragments of stone at the base of our precipice may be called *accidental*, though the shape of each depends upon natural laws, on the nature of the rock, on the lines of deposition or cleavage, &c." † A few observations will show the total inadequacy of this metaphorical illustration.

The indefinite variations in the shapes of the stones bear no natural relationship to their use for the architect, whereas every alteration of structure in a plant developed under changed conditions of life is itself an adjustment to suit the plant in its varying.

Secondly, what takes the place of the architect in the organic

* *Origin* &c. 6th ed. p. 34.
† *Variation* &c. vol. ii. p. 430.

world? His question is like that of Sir A. H. CHURCH, who, finding he could make the dye, madder, just as the plant does, out of the same elements—"What takes my place in the madder plant?" The only answer is "The Directivity of Life."

But when Darwin attributes to the architect the power and skill to make *a noble and commodious edifice* out of unhewn and unprepared stones, he is assuming as possible what cannot be done. No *mortar* is allowable, as it would have to be *designed* and prepared beforehand. The result of an attempt to make such a building will be a rude edifice in unstable equilibrium, as one so often sees in fields where stone walls take the place of hedges, as around Buxton; portions of the walls are continually falling down. This was the cause of the unprecedented loss of life at Avezzano.*

Now, if casual fragments, never intended by Nature to be parts of a building, are comparable to variations in living organisms, the conclusion can only be drawn that *no* plant or animal could ever be, what one may metaphorically call, in "vital stable equilibrium," and would be always as liable to perish as a house built of unprepared fragments.

Turning, then, to natural selection as applied to plants, Darwin writes a section on "Individual Differences," supposed to be comparable with the indefinite variations among the stones.

Comparing this with DARWIN's definition of the process of species-making by means of natural selection, he gives, however, *no instances of any individaul variations ever being injurious, i.e.* so "inadaptive" as to call for "rigid destruction." Injurious variations do not occur in Nature.

We may add to the groundless assumption of "injurious variations" the fact that the theory ignores any natural law governing the appearance of new variations possessing *adaptations* to the changed conditions of life.

If an architect with intelligence is required to build a house, then it is the "Directivity of Life" which adapts the variations of structure in the plant to its new requirements.

A point too much ignored by DARWIN is that a plant or animal cannot really be compared to a house, for *the whole internal anatomy of the living organism* is as equally adapted to the new conditions of life as are the *external*, visible, and distinct organs, *i.e.* the "variations." The internal structure of the roots, stems and branches, and leaves undergo profound changes when a seed of a terrestrial plant is grown in water or *vice versa*. What is it which produces the changes in the *internal* structure? There is only one answer, and that is "Life." It is this which is endowed with the power of making the embryonic cell-structures change their form both within and without the organism, so as to be in adaptation to new conditions of life, and so to establish a new variety or species, as the case may be.

* The death-rate was 90 per cent., *Times*, January 19, 1915. "The houses consisted of stones piled one on the other without binding of cement."

This is what every, or nearly every, seed of a batch undergoes; and the result is that all which vary (as a rule it is all) vary alike in adaptation; while there are none which produce "inadaptive" or, as DARWIN calls them, "injurious" characters.

I repeat and emphasize this, as it is the *cause* of the *failure* of natural selection, for it is not too much to say that the whole theory falls to the ground on the truth or fallacy of the word "injurious." Theories are valueless if they cannot stand the test of experiment or proof. And the real cause of the "Passing of Darwinism" is that DARWIN'S theory has never received any corroboration from facts. No species has ever been *proved,* either by *induction* or *experiment,* to have arisen by *means of natural selection.*

Let us hear his last words on his alternative explanation of Evolution. At the close of the sixth edition of the "Origin &c." he wrote: "It appears that I formerly underrated the frequency and value of the direct action of external conditions, as leading to permanent modifications of structure independently of natural selection. But, as my conclusions have been much misrepresented, I may be permitted to remark that I placed in the introduction of every edition the words: 'I am convinced that natural selection has been the main, but not the exclusive, means of modification.' This has been of no avail. Great is the power of steady misrepresentation, but the history of science shows that fortunately that power does not long endure." *

It has endured till to-day, or fifty-five years. As one example of many botanists who have discarded natural selection, Dr. WARMING thus writes at the conclusion of his great work on "The Œcology of Plants, an Introduction to the Study of Plant-communities" (Eng. ed. 1909):

"It seems to be beyond doubt that characters peculiar to growth-forms have arisen through direct adaptation to the environment or natural self-regulation operating through countless generations, and that at the same time the acquired characters have been fixed to a greater or less extent by heredity."†

"In this matter Lamarck had," he adds, "a keener eye for the truth than many modern investigators appear to possess" (p. 373). The reader will remember DARWIN'S remark quoted above.

* *Origin* &c. 6th ed. (1872) p. 421.

† Dr. Warming had previously said in his *Lagoa Santa* (1892): "Je réponds brièvement et incidemment à la question qui se pose, à savoir, si ces adaptations au milieu doivent être considérées comme une garantie, issue de sélection naturelle, contre l'évaporation [succulent xerophytes], ou bien si elles doivent leur origine à l'action modificatrice des formes, exercée *directement* par les conditions de milieu. J'adopte cette dernière manière de voir" (p. 465).

DARWIN'S ALTERNATIVE EXPLANATION OF EVOLUTION.

By Rev. Prof. G. HENSLOW, M.A., F.L.S., V.M.H.

[Read April 27, 1915; Mr. R. C. NOTCUTT, F.R.H.S., in the Chair.]

GENERAL CONTRAST BETWEEN DARWIN'S "THEORY" AND THE "TRUE CAUSE" OF EVOLUTION.—In my last lecture (p. 47) I showed how Darwin's theory of Evolution by means of Natural Selection is being discarded by many botanists at least, if not yet by zoologists; for it is easier perhaps to see the inability of natural selection to account for the origin of species among plants than among animals. To-day I shall show how Darwin's alternative explanation—for it is no theory—has proved to be the right and only way by which Nature originates new varieties and species, *i.e.* irrespective of crossing and hybridizing.

We will compare the first and last editions of the "Origin" &c.

When he first conceived the idea of "Descent with Modification," as Evolution was then described, it passed through his mind, when in the Galapagos Islands in 1835, that such was due to changed conditions of life, *i.e.* not only the indigenous species of animals and plants, but also variations in the introduced "rats" produced by the new and peculiar climate, food, and soil to which they have been subjected.* But he did not then realize *how*, nor did he formulate any theoretical explanation; but from 1838 onwards he devoted himself to working out the theory of natural selection after reading Malthus' "Essay on Population."

Though he based his theory on natural selection, he never altogether abandoned his original idea; for he concludes the Introduction to "The Origin of Species by means of Natural Selection" with the words: "I am convinced that Natural Selection has been the most important, but not the exclusive means of modification." Elsewhere he says: "To judge how much, in the case of variation, we should attribute to the direct action of heat, moisture, light, food &c. is most difficult. My impression is that with animals such agencies have produced very little direct effect, though apparently more in the case of plants. . . . Some slight amount of change may, I think, be, therefore, attributed to the direct action of the [changed] conditions of life.' "†

In preparing his work entitled "The Variation of Animals and Plants under Domestication" he became much more certain as to the effects of the environment; so that he places the two results on a parallel footing and admits that the latter requires no natural selection at all.‡

* *Naturalist's Voyage* &c. p. 378 (1860).
† *Origin* &c. 1st ed. p. 10 (1859).
‡ *Variation* &c. ii. p. 271 (1868).

No changes occurred in the second to the fourth editions of the "Origin" &c., but in the fifth (1869) he began to make the definite variations rather more pronounced, as it followed the "Variation" &c. (1868), in which Darwin gives two collections of illustrations; * whereas he never gave a single instance to prove the truth of his theory by means of natural selection among indefinite variations.

The sixth and last edition of the "Origin" &c. was published in 1872. He has almost, so to say, saturated it with allusions to definite variations by inserting new paragraphs and altering sentences, even occasionally omitting the words "natural selection," as in the following example:—"In a confined area . . . Natural Selection will tend to modify all the individuals . . . in the same manner." † "In a confined area . . . all the individuals varying in the right direction" [*i.e.* "definitely"] ". . . will tend to be preserved"; ‡ that is, *without* any selection at all. The last sentence explains what DARWIN meant by "definite," in the passage where he draws the distinction between it and indefinite.

"By the term 'definite' I mean an action of such a nature that when many individuals of the same variety are exposed . . . to any change in their physical conditions of life, all or nearly all the individuals are modified in the same manner. A new sub-variety would thus be produced without the aid of selection." § Herein we first trace the recognition of a natural law as the rationale of self-adaptation.

The *locus classicus* for the two views is on the following page: "The direct action of the conditions of life, whether leading to definite or indefinite results, is a totally distinct consideration from the effects of Natural Selection; for Natural Selection depends on the survival under various and complex circumstances of the best fitted individuals, but has no relation whatever to the primary cause of any modification of structure." ||

Darwin intimated, as I quoted in my last lecture, that adaptations were the most important feature of evolution requiring explanation. Definite variations are practically, if not always, adaptations and are the results of response.

When did this idea of self-adaptation occur to Darwin? He tells us in his Autobiography: "I overlooked one problem of great importance . . . viz. the tendency in organic beings descended from the same stock to diverge in character as they become modified . . . the solution is that the modified offspring of all dominant and increasing forms *tend to become adapted to many and highly diversified places in the economy of nature.*" ¶ [My italics.] This "tendency," however, can only be called into action by new and changed conditions of life.

* *Variation* &c. ii. pp. 273, 277.

† *Origin* &c. 1st ed. p. 104. If *all* the individuals vary aright, there are none with "injurious" characters, and consequently there can be *no* natural selection.

‡ *Op. cit.* 6th ed. p. 80.

§ *Variation* &c. ii. p. 271.

|| *Op. cit.* ii. p. 272.

¶ *Life* &c. i. p. 84.

As the above came to DARWIN, as he says, "long after he came to Down" (1842), and the "Variation" &c. was issued in 1868 and the "Origin" in 1859, perhaps we may suggest about 1864 as the year. For this view of adaptations is well developed in the "Variation" &c., as stated.

In 1876 DARWIN wrote to Professor M. WAGNER as follows, clearly showing the utmost importance with which he then regarded "definite variations":

"In my opinion the greatest error which I have committed has been not allowing sufficient weight to the direct action of the environment, *i.e.* food, climate, &c., independently of Natural Selection.

"When I wrote the 'Origin,' and for some years afterwards [four or five ?], I could find little good evidence of the direct action of the environment. Now there is a large body of evidence." *

Yet it must have been, what we may perhaps call, a semi-conscious sense of this truth, when the idea of "Descent with Modification" crossed his mind when in South America. When he discovered the remains of gigantic members of the *Edentata*, now represented by the small Sloths, he seems to have thought the latter might have been descended from the former.

SELF-ADAPTATION, THE CONCLUSION FROM ECOLOGY.—The modern method of "studying" plants or "Ecology," *i.e.* not only plants but their "homes" as well, has immensely strengthened the view that the origin of species is due to self-adaptation to changed conditions of life. There is nothing new in the study itself, only the name. In 1820 M. P. A. DE CANDOLLE was the first real ecologist; for he wrote an article on Botanical Geography in the "Dictionnaire des Sciences Naturelles," in which he traces the influences of all the various factors of the external conditions of plant life, just as Dr. SCHIMPER and Professor WARMING have done to-day; only these and other modern ecologists now carry us farther, for—believing, as we all do now, in Evolution—one cannot look for *Causes* without perceiving that xerophytic, hygrophytic, hydrophytic &c. conditions *themselves* supply the "direct action," as DARWIN called it, to which the plants respond, and so are evolved all the characteristic structures so familiar to us in each of the plant-associations respectively. Moreover, experiments with plants are so easy to make, that the conclusions arrived at from inductive observations in Nature can often be verified by them. Nature, too, often makes experiments and always with the same results.

Dr. SCHIMPER thus writes: "Experience shows that [morphological] differentiation is profoundly and rapidly modified by changes in the environment, every one of which immediately involves a change in the organization of the plants. . . . It is by the adaptations that the causes of the differences in the *facies* of the vegetation at different points on the earth are rendered more comprehensive; so that their

* *Life and Letters*, vol. iii. p. 158 (1876).

investigation is to be numbered among the chief duties of geographical botany." *

Dr. WARMING found this to be the case, as the result of his ecological researches in Lagoa Santa and elsewhere: "It seems to be beyond doubt that the characters peculiar to growth-forms have arisen through direct adaptation to the environment." †

PROFESSOR DE VRIES', PROFESSOR BATESON'S, AND MR. LOTSY'S VIEWS.—Two new views upon the Origin of Species have been advanced since Darwin's book was published: one is by Dr. H. DE VRIES, called the "Mutation Theory"; the other is based on the results of crossing by Mr. LOTSY. Professor BATESON also appears to think that the results of Mendelism may have something to do with Evolution.

Mendelism is solely concerned with the phenomena of the results from crossing or hybridizing, not with the origination of new varieties without these means. It is this which raises the previous question, as to their origin. M. MENDEL crossed varieties of the garden pea, namely those having *grey* and white skins; *round* and wrinkled; *yellow* and green cotyledons; as well as *tall* and short stems. The words in italics are presumably the primitive characters of the wild form, which, naturally, has no varieties. The other characters have been acquired under cultivation. He found that the former were *dominant* and the latter *recessive*.

The primary question to ask is how did the recessive characters originate? The answer is obviously by cultivation in prepared soils, as DE VRIES explained in his general account of the appearance of his so-called "mutants," though we may be quite unable to determine the individual causes of the individual characters, respectively.

In a notice of Dr. VRIES' book I called attention to the fact that the characters relied upon as constituting his "mutants" are not such as a systematic botanist would regard as specific and scarcely varietal, and that they would appear to be simply due to over-nourishment with manure, causing a certain amount of degeneration, for he tells us the original ground was "almost pure sand"; on the other hand, he prepared a "heavily manured" plot whereon to transplant or sow them.

Dr. DE VRIES explains how it is that many varieties appear in a prepared soil of cultivation, unknown in the wild state. He says, speaking of the external causes of the individual differences among seedlings: "Moisture and manure differ on different portions of the same bed in a way unavoidable even by the most careful propagator. Some seeds germinate on moist and rich spots, while their neighbours are impeded by local dryness or by distance from manure. Some come to light on a sunny day and develop their first leaves rapidly, while the following day the weather may be unfavourable and greatly retard growth. The individuals seem to be due, at least in a very great measure, to such apparent trifles."

* *Plant-geography upon a Physiological Basis.* Preface, p. v.
† *Œcology of Plants*, p. 373.

DE VRIES names seven mutants from *Oenothera Lamarckiana*. The descriptions are more or less of the same nature as the following: "*O. leptocarpa*, flowers late, and has long, slender fruits which seldom ripen. *O. nanella*, dwarf, weak, often incompletely developed, small quantity of pollen or none. The stigmas stick together. *O. elliptica*, weak and very early overgrown; pollen often barren. "This feature," he adds, "is quite normal for many species of *Oenothera*," &c.

The reader will see that the mutation theory is only a special instance of results of direct response to new conditions of life. In fact, from DE VRIES' descriptions his mutants seem to come nearer to DARWIN'S "injurious variations" than "favourable ones"! For further details I would refer the reader to my notices.*

NATURE OF PROOFS.—What are the proofs of DARWIN'S alternative? Scientific proofs are either by *Induction*, *i.e.* the accumulation of numerous, independent cases, all conspiring to establish the same conclusion or probability, until the latter amounts to a "moral conviction." Secondly, *Experimental Verification*. This is usually regarded as the most important.

The following few examples may be taken as illustrations from Ecology:—

Cultivation.†—Edible roots.

Xerophytes.—The "mimicry" seen between the North American Cactaceae as well as of *Agave*, with African species of *Euphorbia* and *Aloe* respectively, is presumably the result of the same cause, or the "direct action" of drought, with the "response" of making similar forms of the stems or leaves for water-storage.

The genus *Pereskia*—a tree with ordinary leaves, but growing by the Amazon river—may be contrasted with *Cactus*, as both belong to the same family.

As a spinescent type, *Ononis spinosa* may be compared with *O. inermis*; while the seeds of the former, germinating and growing up in a soil kept moist, result in the latter form without spines.

Hydrophytes.—The Water Crowfoot, *Ranunculus aquatilis* Linn., is an excellent example whereby to prove the Origin of Species by means of the direct action of the conditions of life. Both of our two greatest systematic or descriptive botanists of the last century, Mr. G. BENTHAM and Sir J. D. HOOKER—joint authors of the "Genera Plantarum"—wrote British Floras; but while the former in his "Handbook of the British Flora" (1st ed.) has only one species, HOOKER has described eight in his "Students' Flora of the British Isles."

BENTHAM observes, when describing *R. aquatilis*: "Many of the forms appear to depend so much on the situation the plant grows in, that we can only consider them as mere varieties." He here unwittingly refers to the *true cause* of *all* varieties and species of plants in the world, exclusive, of course, of crosses and hybrids.

* *The Mutation Theory, Journ. Royal Hort. Soc.* xxxi. 1907 and xxxvi. Pt. I. p. 144.

† For other examples see *The Origin and History of Garden Vegetables (R.H.S.)*.

Ranunculus aquatilis Linn., with submerged dissected leaves, is presumably descended from terrestrial species, as several other cases occur, *e.g. Helosciadium, Hottonia,* &c., therefore induction suggests that water is the cause. Mr. McCallum proved experimentally, by adding nutritive salts to the water, how a similar plant (*Proserpinaca* of the U.S.A.) was enabled to produce complete leaves under water. Induction *and* experiment thus proved the fact that the "specific character" of dissected foliage was caused by the direct action of changed conditions of life (Darwin).

It is also hereditary, for it is found to occur equally well when the seed is sown in a garden border, and, as by Nature's experiment, when a pond dries up, and it flourishes in the mud.

Hygrophytes.—Now let us take another species of *Ranunculus*, the "bulbous" buttercup.

Turning to Hooker's flora again, we learn that it is to be recognized by some dozen characters which are taken from all parts of the plant; and although a few points may be common to two species, yet the *totality* distinguishes each respectively. Hence we can describe a *species* as being *recognized by a collection of constant characters taken from all parts of the plant.* If any individuals of a species be found to have something different, though the majority of the characters are the same, it will be a variety, and to discover the cause the observer should at once examine the plant's surroundings, and he will probably be able to account for the aberrant form.

As an example, a variety of *R. bulbosus,* naturally a xerophyte, grows in wet, peaty soil.* It has the same flower and fluted flower-stalk, the same leaves, &c., but it is smooth instead of hairy; it has no "bulb" (strictly a "corm"), it produces offshoots at the base and grows in the lower, wetter sites and avoids the drier parts of the field, where only the common form can grow elsewhere. Moreover, it flowers in August and September instead of June. [This is an unrecorded variety.]

Miscellaneous Changes.—The usual structure of underground creeping stems is the same, viz. increase of cellular tissue with a decrease of the mechanical, &c.

If the shoot of a hop, mint, *Tropaeolum* &c. be buried, when the tip again emerges, the part which has been formed under ground has acquired the structure of a rhizome; such creeping stems are recognized as specific by systematists.

Annuals change to biennials under cultivation, as the radish, carrot, &c., and the perennial wild beet also becomes a biennial. The changed conditions of life, of course, have caused the responsive power of the plants to develop the roots of cultivation.

Such are now more or less hereditary, the cause of the swollen root of the turnip radish or of the turnip itself is the result of the obstruction of a stiff soil.†

* Near to Poole Harbour.
† See my *History of Cultivated Garden Plants* (*R.H.S.*).

The late Professor JAMES BUCKMAN raised a number of different forms of cabbage from seed gathered from wild plants in North Wales. He observed that the "tendency" to vary is "much increased by transplantation." On the other hand, he remarks that "experiments with seeds of plants showing any particular tendency, especially if repeatedly grown in the same soil, will ever result in an increase of the peculiarity."* This tendency to heredity has long been known. Thus M. E. A. CARRIÈRE wrote in 1865 †: "Faisons remarquer que les diverses combinaisons faites pour perpétuer les variétés, ou pour en obtenir de nouvelles, reposent sur cette loi générale que, dans la nature, tout tend à se reproduire et même à s'étendre, que par conséquent les modifications peuvent non-seulement devenir héréditaires, mais qu'elles peuvent encore servir de moyen pour arriver à d'autres modifications, à étendre et à multiplier de plus en plus les séries typiques."

Speaking of "Crosses," Professor BATESON says: "The allotment of characteristics among offspring is accomplished by a process of cell-division, in which the *factors* upon which they depend are sorted out among the resulting germ-cells in an orderly fashion. What these factors are we do not know."

Are they not an *assumption* to account for the appearance of segregated characters out of a complex mixture?

It may be necessary to presuppose some such aid in the cases of crosses and hybrids; but the *origination* of new characters in nature requires nothing of the sort. The general property of Life is to respond adaptively to new external conditions. Of course, it is impossible to say *how* response is effected, but the results are perfectly obvious. Thus similar results arise under like conditions, and plant-mimicry is the result even among the members of the most widely different orders, as Cactaceae and Euphorbiaceae and others, while the effect of water is to make submerged leaves dissected in several families alike.

Recognize this principle of Directivity of Life and the origination of varieties and species becomes obvious, especially in perpetually self-fertilizing plants, which admit of, or secure no, cross-fertilization.

Professor BATESON says: "The appearance of contemporary variability proves to be an illusion. Varieties from step to step in the series must occur, either by addition or loss of a factor."

But the question forces itself on our attention: *How did the first variations arise when there had been no possibility of crossing?* Why is it that so many inland plants have produced maritime forms? *Induction* says, because all have been equally influenced by salt. *Experiment* verifies this inference by producing the same results. The obvious external differences are loss of hair, reduction in the size and form of the leaf, great fleshiness: all being associated with well-marked, internal anatomical changes.

Were all these differences previously inherent in the germ-cells

* *Treasury of Botany, s.v.* "Brassica."
† *Production et Fixation des Variétés* (1865).

in order to meet the conditions, if perchance the seeds happen to reach a sea-coast; or the inland brine-spring of Bad Nauheim, where several plants have assumed the "maritime" characters? Why did they become conspicuous without any crossing?

On the other hand, is it not more probable that Life in plants has the power to vary the structures in response to the exterior conditions?

Of cultivated flowers, Professor BATESON thinks it probable that the majority are descended from crossed plants, and he mentions *Primula sinensis* and Chrysanthemums. But we know the wild form of these. He mentions the Sweet Pea as an instance, in which no two wild varieties are known, just as Dr. LOTSY mentions *Antirrhinum majus*, beans, &c., as "homozygotes"; but neither he nor Professor BATESON replies to this fundamental question, not only of flowers, but we may add vegetables as well, such as cabbage, radish, parsnip, beet, turnip, and carrot. We *do know* how the "turnip" form arose; but it was without crossing, as no two varieties occur in any of the wild forms of these species.

The Professor, however, asks: "Is there such a thing as spontaneous variation anywhere?" The answer is that there is not? On this point, therefore, one must "agree to differ."

With regard to his supposed process of Evolution, Professor BATESON suggests that there may be an "unpacking of an original complex, which contained within itself the whole range of diversity which living things present."

This would seem to be a revival of the old "theory of Emboitement, or 'preformation,' *i.e.* that the original germ of every species contained within it all the countless individuals which in process of time might issue from it 'boxed up' as it were potentially." *

Professor BATESON asks: "Is it easier to imagine the powers" [*i.e.* to "produce the types of life"] "could have been *conveyed by extrinsic additions*?" *e.g.* "We are told that salts of iron in the soil may turn a pink hydrangea blue. The iron cannot be passed on in the next generation. How can the iron multiply itself?

"This illustration may seem too gross; but what refinement will meet the requirements of the problem, that the thing introduced must be, as the living organism itself is, capable of multiplication and of subordinating itself in a definite system of segregation? . . . The invocation of additions extrinsic to the organism does not seriously help us to imagine how *the power to change can be conferred.*"

If I understand Professor BATESON aright, the words I have italicized do not at all represent what DARWIN and present-day Ecologists understand by the "direct action of changed conditions of life." They only provide the *stimulus* to which the Life *responds*; the consequences being the construction of adaptive changes or novelties in the tissues and organs of the plant.

Like the iron he alludes to, salt acts directly upon a plant; hence

* I quote this from my *Evolution and Religion*, p. 19, 1873, when giving accounts of various theories of former days.

the glabrous and succulent conditions of maritime plants. I have taken the seed of *Plantago Coronopus*, a hairy xerophyte, and by watering the young seedlings with salt and water till they arrived at the flowering and fruiting stages, they became identical with the maritime variety in every respect, as in the reduction of leaf-lobes, elongation to a strap-shape, loss of hair, shortness of the flowering spike, &c. This variety is not recorded in our floras.

Besides morphological changes in the "Organs," the whole internal anatomy is changed. *Ex uno disce omnes.*

Professor BATESON remarks that "This is no time for devising theories of evolution." On the other hand, though DARWIN called "The Origin of Species by Means of Natural Selection" "his theory"—one which has never been *proved scientifically* to be true—the origin by self-adaptation through response to changed conditions of life is no "theory" at all, but is simply based on innumerable *facts.*

With regard to pollination, of course necessary in crossing, as the supposed origin of species by Dr. LOTSY, one important fact, seemingly overlooked by both Professor BATESON and Dr. LOTSY, is that varieties may arise *without* any crossing by pollen at all.

Professor BATESON states that "We reach the essential principle that an organism cannot pass on to offspring a factor which it did not itself receive in fertilization."

Similarly Dr. LOTSY says: "A homozygote is absolutely stable and produces offspring which is genetically identical with it—with the exception of mere temporary non-transmittable modifications."

Many plants, however, both cultivated and wild, have produced varieties so recognized by BENTHAM and HOOKER, which are the result, not of crossing, but of different external conditions. Thus, Mr. BENTHAM recognizes as varieties, which HOOKER regards as species, "forms" of *Ranunculus aquatilis*; while of *Polygonum aviculare* HOOKER has varieties which BENTHAM does not allude to. This, moreover, is a good example of self-fertilization, the following being HOOKER's descriptions: "*Polygonum aviculare*, proper, leaves *rather thin*, fruit dull, included. Var. *P. litorale*, leaves *rather fleshy*, fruit more shining, tip exserted, littoral, the passage to sp. *P. maritimum*; . . . var. *arenastrum*, a sand-loving *prostrate* one; var. *microspermum*, a small fruited one; and var. *rurivagum*, a wayside one, with *narrow, very acute* leaves." I have italicized the English words which indicate the characters corresponding to the nature of the localities. These characters could have been pretty well foretold, if the *nature* of the *localities* respectively were known; for the surrounding conditions are the primary *causes* to which the plant *responds.*

This species has a special interest, inasmuch as Mr. LOTSY and Professor BATESON would regard the crossing varieties as the origin of species; but the knotgrass happens to be perpetually self-fertilizing.

That self-fertilized plants cannot produce varieties is also disproved

by the fact that in deserts numerous "species" are recognized, of genera growing elsewhere with conspicuous flowers, which have varied into the cleistogamous state in the absence of insects.*

The origin, therefore, of varieties is obviously self-adaptation to new conditions of life. This corresponds with DARWIN'S "Definite Variation."

As an important result of the ecological method of studying plants, it will be discovered that all the peculiarities of structure by which Monocotyledons are distinguished from Dicotyledons can be correlated with those of aquatic Dicotyledons; so that the cumulative coincidences prove inductively that the former class have been derived from the latter.† Similarly it is a very probable inference that Dicotyledons were derived from Gymnosperms; but as the proof must come from extinct plants, there are still important links which remain as yet undiscovered, as the source of the ovary, style and stigma.

CONCLUSION.—The few examples herein supplied can be multiplied indefinitely; but what I am anxious for the reader to remember is that the long experience of cultivators and scientists, like CARRIÈRE and BUCKMAN in the 'sixties; of scientists of to-day, as SCHIMPER, COSTANTIN, and WARMING, all agree in the same conclusion that DARWIN'S alternative is "forced" upon everyone who will patiently study Nature from his point of view. That conclusion, I repeat, is, that the origin of altered structures—whether they be merely temporary, or fixed and hereditary, and called varieties and species by systematists—is, in every case, due to the power of plants to respond to the direct action of changed conditions of life.‡

* I have described and figured several species in my paper on "The Origin of Plant Structures by Self-Adaptation to the Environment, exemplified by Desert or Xerophilous Plants" (*Journ. Linn. Soc. Bot.* vol. xxx. p. 218, 1893).

† *Journ. Linn. Soc.* vol. xxix. p. 485 (1892); and *Ann. Bot.* vol. xxv. (1911).

‡ M. Costantin observes: "Nous sommes amenés à penser, pour ainsi dire *invinciblement*, que l'on ne peut expliquer les caractères généraux des plantes arctiques que par une adaptation. *Si toutes les plantes arctiques sont vivaces, c'est parce qu'elles vivent au voisinage du pôle*" (*Les Végétaux et les Milieux cosmiques* (ADAPTATION—EVOLUTION), 1898).

CHRYSANTHEMUMS IN POTS.

By THOMAS STEVENSON, F.R.H.S.

[Read March 30, 1915; Mr. E. A. BOWLES, M.A., in the Chair.]

OF the many garden plants amenable to pot cultivation, the Chrysanthemum is probably the most popular, owing to the simple treatment it calls for, the diverse colours and varied forms of its flowers, its adaptability to decorative purposes, the lasting properties of its blooms, both on the plants and when cut, and the long season over which the plants may be had in bloom, a carefully-selected collection giving us a wealth of blossom from August to the end of February.

As a subject for exhibition the Chrysanthemum has for many years enjoyed considerable popularity, and, despite the frequently expressed predictions of its fall from favour, there are to-day more shows held for the express purpose of exhibiting Chrysanthemums than for any other flower, not excepting the Rose. Gloomy indeed would be many of our Autumn Exhibitions, as well as our greenhouses and homes, were it not for the brightness imparted to them by this, the Queen of Autumn Flowers.

There is not the time, nor is this the place, to deal at length with the history of our subject. That it is a plant of high and ancient lineage is evident from the fact that reference is first made to it some 500 years B.C. But it was at a very much later date that we first hear of its introduction into England, about the year 1764, although it was not till 1795 that its cultivation was seriously taken in hand, since which time it has never looked back, and its evolution has steadily advanced until the present day.

At the earlier exhibitions of the flower the Pompon and Incurved varieties predominated; in fact there were no Japanese varieties grown in this country till 1870, when they were introduced by Mr. ROBERT FORTUNE. Although they were not well received at the time, it may be said that for all practical purposes they have now ousted the Pompon, Reflexed and Incurved varieties. True we still have a few of the latter at our exhibitions, and some five or six varieties of Incurved are cultivated in quantity for market purposes, but it is the Japanese and single varieties that are to the fore to-day, and it is with these types of the flower that I propose to deal.

To-day growers have much to be thankful for, as even within my recollection most of the Japanese varieties averaged from eight to ten feet in height, and with this amount of growth they did not give us anything approaching the size and form of flower which we can now get on plants varying in height from 2 feet 6 inches to 6 feet,

with good, stiff foliage, which under good cultivation may be preserved almost to the top of the pot even when the plants are in bloom.

Nearly every gardener, at some time or other in his career, has been fascinated by this large-flowered section ; the amateur also, when taking up plant cultivation as a hobby, invariably selects the Chrysanthemum for the autumn, no matter what other plants occupy his time and attention during the rest of the year. This craze, or perhaps it were better to term it taste, is not to be wondered at ; for, leaving out everything else that may be said in favour of it, there is no plant that responds so readily to good cultivation, and the amateur—in particular—likes to note the difference that a little extra attention or manure makes to his plants.

Among market-growers the Chrysanthemum in pots is one of the largest, if not the largest pot-culture in this country. Many hundreds of thousands are grown to furnish a crop after the houses have been utilized for tomatos during the summer months. It would be difficult to estimate even the approximate quantities grown, but to give some little idea of the vastness of the industry I may say that I know one firm who cultivates 126,000 in nine-inch pots, 23,000 of these being one variety which is much in demand late in the season, while two other firms cultivate between them about 116,000 in pots. The three firms cultivate in the open ground, with more or less protection, about 590,000 plants, making a total of 822,000 Chrysanthemums, all of which are exceptionally well grown. One firm spends no less than £5,000 in labour on the Chrysanthemum crop alone.

The number of plants cultivated in pots for cut-flower purposes exceeds by many times those grown as pot plants, or for sale as such, though this side of the industry is by no means a small one, and the perfect specimens one sees in our markets during the season are ocular demonstrations that the market grower thoroughly understands his business.

The decorative possibilities of cut Chrysanthemums are unlimited, and no matter whether they are grown as huge specimens, as good-sized market samples from four to six inches in diameter, or as sprays, and whether they are Japanese, Incurved, Reflexed, Pompons, Anemones or singles, all have their various uses, and associated as they are at the season of the year with the various autumnal tinted foliage, nothing could give greater satisfaction.

At the outset I mentioned that one of the plant's qualifications was its ease of cultivation, and to amplify this I should like to say that the Chrysanthemum will put up with treatment such as would kill most other garden plants and still give moderate results ; but this is not the kind of thing to be recommended, and what I really wish to do is to emphasize the various points that are essential to ensure good results.

With the Chrysanthemum, as with all other plants, no hard-and-fast rules can be laid down as to what are the best methods of cultivation. Different growers may and do employ different systems in their

endeavour to obtain good results, so that after all it is the close attention to detail that is necessary in each and every case to ensure success.

The selection and care of stock plants is an important factor, and when large quantities are grown the health and vigour of a variety can only be maintained by selection—propagating only from the plants that are most robust and those which have produced the best-coloured flowers.

Immediately after the blooms have been cut, the selected plants should be cut down—but not too low, as plants that have been fed fairly late to ensure a well-finished crop of bloom are apt to bleed if so treated, and if this happens the stock is very much weakened, the cuttings take a long time to root, and never make really good plants. The stools should then be removed to a bright, airy house or frame, and if the plants have been infested with any pests, such as mildew, rust, fly, or the leaf-mining maggot, steps should be taken to cleanse the cuttings thoroughly by spraying once or twice before they are removed for propagation. When it can be managed, rested stock—that is plants which have been planted in the open ground for one season and not allowed to flower, and afterwards lifted and placed in a house or frame—furnish the very best cuttings; and although these cuttings may not be so large as those taken from the pot plants, they root quicker and ultimately make better plants.

Propagation by means of cuttings may be carried out any time from early December to the month of May, though for ordinary exhibition purposes and for cut flowers generally the best time is from early December to the middle or end of February, and by the end of June there will not be a great deal of difference in the plants propagated between these dates, but in the case of the later-rooted plants they will need to be shifted or potted on rather more quickly.

When very large quantities of cuttings are to be rooted they may be dibbled out in beds or benches of light soil in a house where the temperature can be kept at about 50° F. In such cases there is no need to place these cuttings in propagating frames, as the house may be treated as such, and providing due care is given to keep a certain amount of atmospheric moisture in the house during the time the sun is out there will be very little danger of flagging, though, if the cuttings are not put in till the latter part of February and the weather is really sunny, a slight shading may be necessary when the sun is bright.

Boxes, of course, may be utilized for the cuttings instead of dibbling out in beds of soil. Moderate-sized cuttings are to be preferred. These produce roots not only quicker but in greater quantities than larger and softer cuttings, while the tendency to flag during the rooting period is much less.

The amateur, who naturally requires only a small number of plants, may root his cuttings in a propagating frame, which may be placed in a cool house. In this case they may be put either singly in thumb-pots, three or four round the sides of a large 60, or in shallow boxes. During the period of rooting the frame must be kept close,

though at night a very slight crack of air may be put on to free the frame from any surfeit of moisture, and so prevent damping.

As soon as it is observed that the cuttings have taken root, the hardening off must be commenced, by the admission of air both day and night, finally removing the glass altogether, when the young plants should be ready for transferring to the shelf or staging of a cool greenhouse, or a frame where a slight amount of heat may be maintained, but this must be governed somewhat by the date of propagation.

Cuttings rooted in boxes, three or four in a pot, or in a bed of soil, must be potted off singly before the roots have attained sufficient length to be damaged in the process of potting, and it may be necessary to restrict the amount of air for a few days; also, to help them or keep them from flagging, a slight spraying overhead should be given on all occasions when the state of the weather warrants it. Plants potted early in the year will need very little spraying, but from the end of February they may require it twice a day for a few days after potting. The size of pot to be used must be governed by the size of pot in which they are to flower. Singles and decoratives generally are flowered in 9-inch or 16 size pots; the first potting should be into 60's, second potting 48's, and the final 16's.

For exhibition varieties rooted in thumbs, first potting should be into 54's, second into 32's, and the final into 10 or 11 inch, according to the vigour of the variety.

It is useless and unnecessary to say exactly what mixture of soil to use, but it should be moderately light and open, not too rich, to encourage a quick formation of the roots, and it must be made fairly firm in the pots.

By the middle of March all the young plants will be fit for removal to a cold frame. Brick frames may be preferable, as requiring less protection in the event of severe frosts, but the ordinary wooden frame will do quite well providing due precautions are taken. Watering at this time must be carefully done, and only during exceptionally mild, bright weather must the young plants be sprayed after mid-day, but as the days get warmer spraying twice a day will assist growth.

The amount of air admitted to the frames must be governed somewhat by the state of the weather, and of course by the condition of the roots.

Do not ventilate the frames by tilting from the back, as in such a case the front plants during bright sunshine are enduring the temperature of a stove whilst the back ones are as cool as they ought to be; so tilt the lights sideways, always in the opposite direction to the wind, and thus secure much more even ventilation, free from draughts.

By about the first week in April forward plants will be ready for their second shift, either into 48's or 32's. At this potting the soil should not be so fine as at the previous potting; a little well-decayed manure may be added to the loam, and in addition a 48 potful of bonemeal and a shovel or two of wood ashes to each barrow-load.

At this potting the soil should be made very firm to counteract as

far as possible too soft a growth in the plant, which at this season is apt to be very rapid under the influence of more genial weather conditions.

When replacing in the frames, allow sufficient space between the plants for development during the next month or five weeks, and so obviate the necessity of shifting them again before they are placed in the open air.

Within two or three days after potting they should be well watered in, after which due care must be taken till the plants are well rooted, and even then too generous treatment in this respect only results in very soft growth, which is the one thing to be avoided in the cultivation of Chrysanthemums.

The days being now very warm, it is not advisable to keep the plants close after potting, but admit plenty of air, and, to avoid any tendency to flag, spray the plants overhead as often as necessary. When the roots are running freely in the new soil, remove the light entirely whenever the weather permits it.

Varieties being grown for exhibition will require staking before being placed in the open early in May, as will also a good many of the decorative varieties, and it is advisable to put stakes to those sufficiently long to carry them until they are placed in their summer quarters.

By the second week in May the forward plants will again be ready for potting, this time into their flowering-pots.

The soil for this purpose should be mixed a few weeks beforehand, and should be rougher and of a more holding nature than before. Good loam, well-rotted manure, bonemeal, wood ashes, and old mortar rubble make a good compost with sufficient coarse sand or grit to make it somewhat porous.

The pots—as at all previous pottings—should be clean and well crocked. The latter is essential, as if the pots are well crocked a very wet period has not the bad effect on the plants that it would have if the drainage were defective.

If the soil is in a proper condition as regards moisture, it cannot be made too firm in the pots (within reason); and when more than one man is potting a batch of plants it is wise for the plants they pot to be kept separate, as the difference in two or more individuals' potting is so great as to make a good deal of difference in the watering.

The plants should stand quite close together for a week or two after the final potting, for convenience in spraying; it also keeps the soil from drying out as quickly as it would do if the plants were spaced out, and so root growth is increased and the plants get over the check much more quickly.

If the weather is hot and dry, watering in must be done the second day after potting or the plants may become what is termed ball dry, and if this happens it may take quite a long time to get them soaked again.

This has to be guarded against, particularly when the plants happen to have been left too long and become pot-bound in the 48's or 32's; but I should like to emphasize the necessity of getting them potted

into the flowering-pots before they are too heavily rooted. The latter condition unduly hardens the wood, and more often than not a loss of foliage later in the season is the result.

As soon as the roots are running freely they should be spaced out: that is, placed in their summer quarters, sufficient space being allotted to each plant to allow of its fullest development. If not given sufficient room the shoots become attenuated and there is extra trouble in tying, &c.; needless to add, the plants should be staked at once, securing them to wires running the length of the rows.

Exhibition plants may with advantage be stood on tiles, or on two battens, 2 or 3 inches apart; this allows of the free egress of water from the pots, and at the same time ensures the pots being free from worms, which in the early autumn are often troublesome.

Up to this point the treatment outlined is for all early-rooted plants, Japanese, Incurved, Singles, or Decoratives, but I would point out that in the matter of soil, water, and attention it should be a little more generous for the exhibition plants or for large flowers, the decorative types being kept just a little harder in growth all through the season.

From now onwards the exhibition plants will need considerable attention, and on all fine days the plants should be thoroughly syringed twice a day—about 10 and 3. This may seem early in the afternoon, but I prefer to get the plants thoroughly dry before the evening, the dews supplying all the moisture they require after the sun sets. Syringing should be gradually discontinued after the third week in August. Anything tending to soften the foliage too much should be avoided; in such a state it is more susceptible to mildew; and I might add that weak soot-water should be used all through the season for syringing. Not only does this promote good health in the plants, but it makes them less liable to attacks by insects and fungi.

Watering at all times must be carefully and well done; the plants at no time should suffer from drought, but an excess of water at the root must be as carefully guarded against.

Tying must be regularly attended to, as the loss of even a single shoot where there are only two, three, or four on a plant means a lot.

During the months of May and June some varieties need a little attention to get them to flower at about the right time for exhibition purposes, and each variety must be studied. The later-flowering varieties may need the points taken out perhaps a week or two before they make a natural break; others that naturally bloom too early may need stopping after they have made their natural break, usually some time between June 7 and 21; very few varieties require it later than this. I do not recommend the practice of stopping early in the season, say March or April, as it proves too severe a check whilst the plants are in the small state; whereas later, when they are stronger and the weather conditions more conducive to quick growth, they recover from the check more readily.

The feeding of exhibition Chrysanthemums is a matter that must not be neglected. The plants at no period of their growth should

receive a check, so that feeding in moderation should be commenced even a little before they have exhausted all the goodness in the soil. I prefer to commence with soot-water or a little liquid cow manure some time in July, following it up with a dressing or two of artificial manure as it becomes necessary. A good compound manure should be used, though in exceptional circumstances a dose of sulphate of ammonia or nitrate of soda may be given, but unless the weather is very hot such manures are too stimulating, repeated applications resulting in a greater wealth of foliage than is necessary, and if applied late in the season the tendency to damp is much increased. Feeding may be continued till the blooms are about one third expanded, but discretion must be used at all times, taking into consideration the state of the plants and the existing weather conditions.

Buds taken from the 8th to the 20th of August produce the best blooms ; at the same time a few varieties may open their flowers well if taken before the earliest date mentioned. There are a few that produce good blooms from an even later date, but in stopping the plants the grower should at least aim at getting the buds to show at or about these dates.

We may now return to the decorative varieties, including all classes of the flower. There are different systems of cultivating these. Some growers prefer to pinch the plants when 5 or 6 inches high and again after they have made a further growth of 5 or 6 inches, to induce a bushy habit of growth, the last pinching usually taking place after they are established in their flowering-pots. After this pinching they are usually allowed to flower naturally in sprays, or disbudded, one bloom to each shoot. This, I may say, is the usual practice, but for a number of years now I have adopted a different system, allowing the plants to grow naturally from the time the cuttings are rooted until the buds are fit for taking. They are struck and potted on as outlined earlier in the paper, and are treated as hard as possible early in the season, an excess of water being particularly guarded against. By this treatment the growth is very hard and the plants break naturally, and give me even more shoots than I can obtain by pinching. Very little, if any, manure is given till the flower-buds appear and are, where necessary, taken ; when they are fed regularly, though not so heavily as the Japanese, the wood is stiffer and less attenuated, the plant more shapely, and the flowers as good as, if not better than, can be obtained by any method of stopping.

One stake only is necessary to each plant, the shoot being slung to this central stake probably twice during their season of growth.

The market grower who aims at securing good-sized blooms, say 4 to 6 inches in diameter, adopts much the same methods, except that he usually tops his plants once just before they make their first natural break, in May or very early June. He may do so again with some varieties to hasten or retard the date of their flowering, but he usually secures the number of shoots he requires on the plants from the first topping and takes the first or second buds after the break, according to the varieties.

Late struck plants, say those rooted from the end of March to the first week in May, are very useful in the conservatory or in the decoration of the home, and if kept to one stem many varieties will give really first-class exhibition flowers; the treatment is much the same as already outlined for the Japanese varieties. They are best rooted in boxes and potted off early into 60's, being shifted on into 48's and then into 32's or small 24's as quickly as they require it, making the soil very firm at the last potting. Some varieties will break naturally at about the right time, but failing this they should have the points pinched out about June 10 and with careful treatment will make good plants, varying in height from about 2 feet to 3 feet 6 inches. To preserve the foliage in these small pots watering and manuring must be rather more liberal than in the case of the large pots, though if extra dwarf plants are desired the manuring must be deferred somewhat till after the buds are taken.

Very dwarf bush plants may also be secured by this system of late propagation, and for this purpose a rigid selection of varieties must be made, choosing those that are naturally dwarf in habit and that break freely from one pinching, though if rooted in March and the plants grow quickly it may be possible to pinch them twice and so secure more shoots. Very firm potting is essential, and only sufficient manure must be given to keep the plants healthy in the small pots. It is far the best practice to disbud such plants one bloom to each shoot, after which they will take quite a lot of manure—for preference little and often.

The date of housing the plants naturally varies in different localities, but generally speaking all plants for large blooms should be under glass by the first week in October. It may be necessary to house some of the earlier varieties sooner than this; in fact they are best under cover before they show colour.

The housing of the decorative varieties naturally depends upon the season of blooming. Some of the early ones may have to be housed early in September to ensure good, clear flowers. Mid-season varieties should be put in at the end of the month or early in October. After this date all varieties that are left out should be provided with temporary shelter in case of frost, and by this means, in some districts, they may remain out till the first or second week in November.

The treatment of the plants under glass is fairly simple. Exhibition plants naturally need more care, owing to the length of time they are opening. Immediately after housing, all the air possible should be given, lessening the amount as the blooms develop and the outside weather conditions get worse. To avoid damping, never allow the temperature to rise very high under the influence of sun-heat. Shade to avoid this, also endeavour to prevent direct draughts from the ventilators, and at all times have sufficient heat in the pipes to keep the atmosphere of the house dry and moving. This applies to all classes of plants. Watering must be carefully done, though it is a mistaken policy to keep the plants too dry after housing, as they naturally suffer a little through the change in the atmospheric

conditions of the house after getting the benefit of the night dews &c. whilst in the open. As mentioned earlier in my paper, do not leave off feeding too soon, and in the case of the late varieties feed about the same as out of doors till the flowers show colour ; any check or want of nourishment during the opening period will result in short-petalled and often badly-coloured blooms.

Generally speaking, the pests that attack Chrysanthemums are not difficult to deal with. Rust in some instances is troublesome, but if the plants are dipped or sprayed once or twice in the early stages and sprayed again before housing with sulphide of potassium, ½ oz. to the gallon of water, it may be kept under, the same solution being effective for mildew. Green and black fly are sometimes troublesome all through the season, but spraying with paraffin emulsion, XL. insecticide, or any of the other washes on the market quickly exterminates these. The leaf-miner maggot in some seasons does a deal of damage to the foliage. Spraying with soot-water all through the season helps as a preventive, and I have found paraffin emulsion effective before the maggots actually get to work under the foliage, but after they have started operations nothing but hand-picking does much good.

The question of varieties is a difficult one, there being so very many, every one of which has some special merit, so that a selection is really a matter for the individual and his or her own requirements. I venture to give a list, or short lists, which I think suitable for the various purposes and to cover a fairly long season, but before doing this I wish to acknowledge my indebtedness to my friend Mr. Cole, of Feltham, who prepared the coloured slides with which my lecture was illustrated, and to my market-grower friend who kindly supplied me with details of the plants they cultivate.

Japanese Varieties.

Amy Poulton.
*Bob Pulling.
Fred Chandler.
*Frances Joliffe.
Eclipse.
*His Majesty.
*Kara Dow.
*Joan Stratton.
*Master James.
Mrs. A. T. Miller.
*Mrs. E. A. Tickle.
Miss A. E. Roope.
Mr. Keith Luxford.
Mrs. G. Farrer.
Miss Gladys Herbert.
*Queen Mary.
*Rosamund.
*William Turner.
W. Rigby.
Captain Fox.
Earl Roberts.
*Fred Green.
F. S. Vallis.
General Smith-Dorrien.
*Hon. Mrs. John Ward.
James Stredwick.
*Lady Talbot.
*Mrs. R. C. Pulling.
*Mrs. W. Tricker.
*Mrs. G. Lloyd Wigg.
Maud Lousada.
Mrs. J. Gibson.
*Mrs. T. Stevenson.
Mrs. A. H. Sanders.
Reginald Vallis.
Undaunted.
*White Queen.
William Vert.

Those marked * are particularly well adapted for striking late and growing in small pots.

Decorative Varieties.

Almirante.
Alcalde.
Mercedes.
Cranfordia.
Market Red.
General French.
Source d'Or.
Mrs. McNiell.
Phœbe.
Tom Page.
Maud Jefferies.
Freda Bedford.
A. J. Balfour.
David Ingamels.
W. H. Lincoln.
Winter Cheer.
Negoya.
Mrs. J. Thompson.
Yellow Mrs. J. Thompson.
Autocrat.
Débutante.
Cranford Yellow.
Mrs. W. Roots.
Money-maker.
Yellow Money-maker.
H. W. Thorpe.
Mrs. J. W. Streeter.
Mrs. R. Hamilton.
Black Prince.
Ivy Gay.
December Gold.
Miss A. Brooker.
Heston White.
Baldock's Crimson.
Bronze Cheer.
Bertha Lachaux.
Mrs. J. W. Crossley.
Victoria.
Yellow Victoria.

Single Varieties.

*Joan Edwards.
*Ideality.
*White Beauty.
Pagram family.
Celia.
Mrs. Walter Hemus.
Portia.
Excelsior.
Molly Godfrey.
Sandown Radiance.
*Bronze Beauty.
Merstham Jewel.
Kathleen May.
*Mary Richardson.
*Sylvia Slade.
*Manor House Terra-cotta.
*Mensa Family.
*Ceddie Mason.
Florrie King.
Miranda.
Calgary.
Jessica.
Commodore.
Chestnut Beauty.
Exmouth Yellow.
Ethel Mortimer.
*Lawrence's Pink.

Those marked * are very suitable for growing in sprays.

REPORT ON METEOROLOGICAL OBSERVATIONS AT WISLEY, 1914.

By R. H. CURTIS, Hon. F.R.H.S.

THE meteorological observations made at the Society's observatory at Wisley have been continued without interruption throughout the year, and the present is the eleventh annual report of the results obtained since the observatory was established.

The weather of the year 1914, so far as its character is indicated by the observations, presents few features of very special interest. Taken, as a whole, the year was a dry one, the rainfall being below the normal amount in seven months of the twelve, and at times the want of rain was a source of considerable trouble to gardeners; but the closing month of the year was one of almost unparalleled wetness, the rainfall for the whole of England and Wales being rather more than double, and at Wisley more than three times, the normal amount for December. The year was also a warm one, and the mean temperature exceeded the average in nine out of the twelve months, the relatively cool months being those of early summer, whilst the later summer and autumn months were dry and favourable for ripening crops and for harvest operations. There was also no lack of sunshine, especially in those months in which the sun's direct heat is most needed; and finally such strong winds as were experienced came at the season of the year when they are expected, and caused very little damage. The chief climatic features of the year are seen at a glance by referring to the diagrams, the first of which (fig. 37) shows how the temperature, after beginning with unusual cold, then kept above the normal throughout nearly the whole of the remaining months of the year; whilst in the lower part of the diagram the dryness of the spring and summer months is also shown.

Fig. 38 indicates the relation between the mean temperature of the air and that of the soil at depths of 1 foot and 4 feet below the surface. It will be seen how, even at the moderate depth of one foot, the soil retains right up to the close of the year much of the warmth it absorbs from the summer sunshine.

In fig. 39 the dominant winds are indicated, and also, by the shaded circle, the relative prevalence of calms.

Fig. 40 exhibits the mean range of temperature from month to month as shown by the maximum and minimum thermometer, and also by a minimum thermometer laid upon close-cropped turf and fully exposed to the sky, and giving an indication of the extreme degree of cold to which growing plants are subject at night.

The observations for the several months are as follows:—

January.—The phenomenally mild weather which had been so remarkable a feature of the closing months of 1913 came to an end with the opening of the new year, and throughout January the weather was upon the whole colder than usual, generally dull, and very dry. Near its close, during the prevalence of an easterly wind-current which

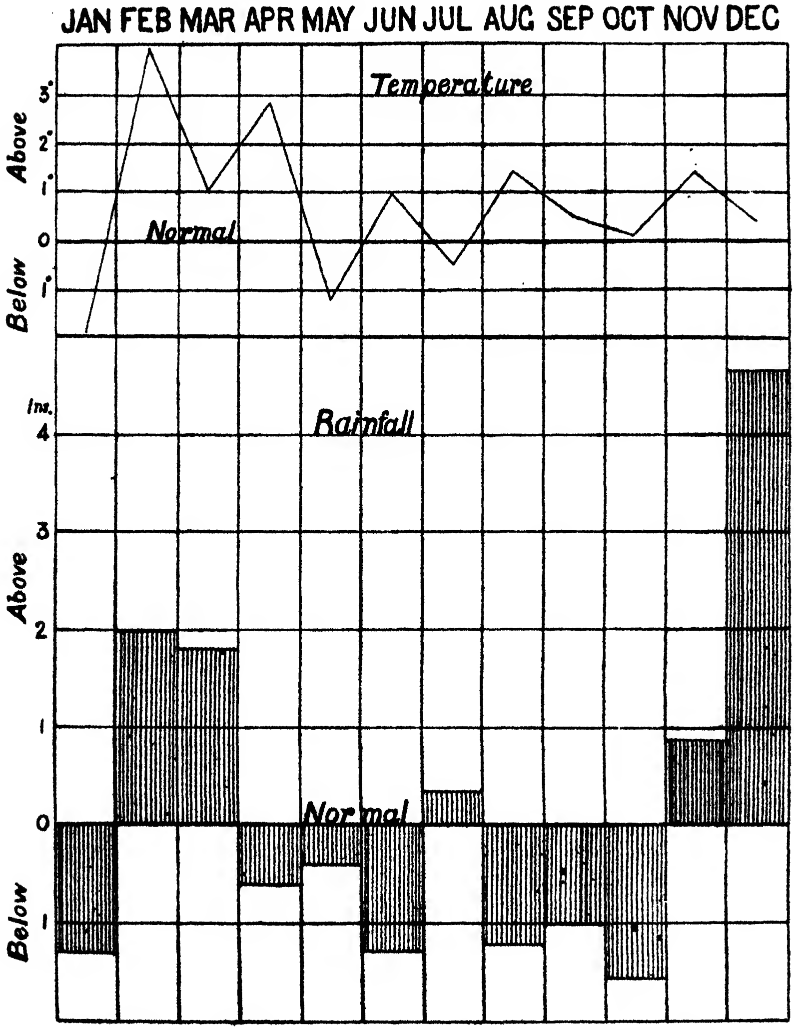

Fig. 37.—Monthly Mean Deviations from the Normal of Temperature and Rainfall at Wisley.

drifted over us from the Continent, some very low temperatures occurred over a considerable portion of the kingdom, and at Wisley the minimum thermometer in the screen, four feet above the ground, fell 17 degrees below the freezing-point; whilst a thermometer laid upon the ground fully exposed to the sky fell 8 degrees lower to 7 degrees Fahrenheit. But this extreme cold did not continue very long,

and the closing days of the month were much less arctic in character. A good deal of damage was done in gardens by the severe cold, and at Wisley various trees and shrubs, which had been coaxed by the mild weather which had preceded it into making new growths prematurely, were severely cut back. There were a few favoured districts which had rather more than their average amount of sunshine, but over the greater part of the kingdom the amount registered was considerably less than usual. At Wisley it averaged less than an hour and a quarter a day, and more than half of the total amount was recorded in the first week. But although the weather was cloudy and dull it was also unusually dry, and there were few parts of England where the rainfall amounted to so much as one half the average quantity. At Wisley the total fall was only half an inch, one half of which fell on one day.

The results obtained from the observations made at Wisley each day at 9 A.M. are summarized in the following table :—

Mean temperature of the air in shade	37·1°		
Highest ,, ,, ,, ,,	55°	on the	9th
Lowest ,, ,, ,, ,,	15°	,,	24th
Lowest ,, on the grass	7·5°	,,	23rd
Number of nights of ground frost			24

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	37·4°	39·5°	42·4°
Highest ,, ,, ,, ,,	44°	43°	44°
Lowest ,, ,, ,, ,,	34°	37°	41°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 92 per cent.

Rain fell on 10 days, to the total depth of 0·53 in. (equivalent to about $2\frac{1}{2}$ gallons of water to the square yard). Heaviest fall on any day 0·23 in., on the 9th.

The prevailing winds were from S.W. and N.E.

The average velocity of the wind was 7 miles an hour.

There were 39 hours of bright sunshine, equal to 15 per cent. of the greatest possible amount.

There were 11 days on which no sunshine was recorded.

February.—The advent of February brought with it a type of weather entirely different from that which had prevailed throughout January, and the month was windy, mild, and wet, the latter feature being especially marked all over the western portion of the kingdom, where the rainfall was in many districts the heaviest experienced in February for many years. But all over the south of England also the fall of rain exceeded the normal amount, and in the Thames Valley there were very serious floods, a great deal of land in the neighbourhood of Wisley being for some days under water. An exception to the general wetness was found in the eastern parts of England, where the total rainfall for the month was rather less than the average. The month was also exceptionally warm, the temperature exceeding the average all over the kingdom. At Wisley the thermometer rose to nearly 50 degrees, and frequently to above that point, every day ; and in London maxima exceeding 50 degrees were recorded on eighteen consecutive days, which for February was a record experience. All through the month, too, the weather was windy and boisterous, and in some gales the wind attained great violence and did a good deal of

damage; even in inland districts it reached quite unusual strength, as in North-east Surrey, where a gust velocity of 70 miles an hour was recorded. These winds accompanied deep cyclonic systems which swept over the country from the south-west, and coming from the warmer regions of the Atlantic they brought with them the abnormal warmth and rainfall experienced. As evidence of the mildness of the weather, many flowers were in full bloom at Wisley at an unusually early date—amongst others, Narcissi of various kinds; flowering trees and shrubs were, however, somewhat later this year than in 1913.

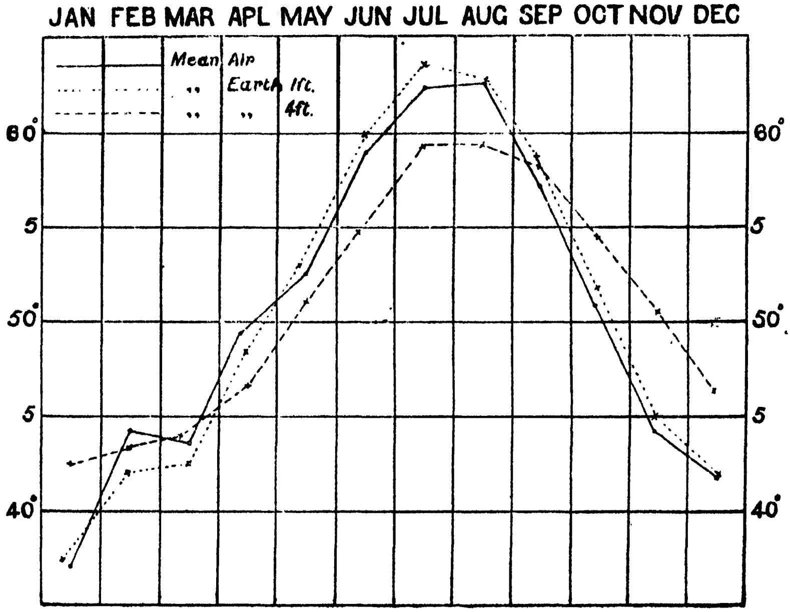

FIG. 38.—MEAN TEMPERATURES OF AIR AND SOIL THROUGHOUT THE YEAR.

The Wisley daily meteorological observations give the results shown in the following table:—

Mean temperature of the air in shade	44·4°		
Highest " " " "	57°	on the 14th	
Lowest " " " "	27°	" 27th	
Lowest " on the grass	19°	" 28th	
Number of nights of ground frost			19

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	42°	43°	43°
Highest " " " "	47°	45°	44°
Lowest " " " "	39°	41°	42°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 90 per cent.

Rain fell on 15 days, to the total depth of 3·36 in. (equivalent to about 15¾ gallons of water to the square yard). Heaviest fall on any day 0·58 in., on the 21st.

The prevailing winds were southerly.

The average velocity of the wind was 9 miles an hour.

There were 89 hours of bright sunshine, equal to 32 per cent. of the greatest possible amount.

There were 7 days on which no sunshine was recorded.

March.—The dominating features of the weather throughout this month were very similar to those of February—gloomy, wet, and stormy. Gales were unusually frequent, and although as a rule they were not very severe, yet in some instances they caused considerable damage to trees and shrubs. But the passage across the British Isles, in a constant succession, of the atmospheric disturbances to which these winds were due kept the weather in a most unsettled state; and since, as a rule, their centres passed along a south-west to north-east track, the dominant winds were from the rainy quarter, and brought with them not only an abundance of rain, but also a temperature slightly above the average. At Wisley the total rainfall amounted to over four inches, which is nearly twice the usual amount, March being a month whose chief characteristics are dryness and dust. In many parts of the country there were serious floods; and generally the conditions were such as to interfere with all garden and farm work materially, and to retard the flowering of trees and shrubs, and the progress of vegetation generally.

The mean results of the daily observations made at Wisley are as follows:—

Mean temperature of the air in shade	43·6°	
Highest ,, ,, ,, ,, ...	63°	on the 31st
Lowest ,, ,, ,, ,, ...	27°	,, 28th
Lowest ,, on the grass	18°	,, 22nd
Number of nights of ground frost		17

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M. . . .	42·6°	43·3°	43·8°
Highest ,, ,, ,, ,, . . .	46°	45°	45°
Lowest ,, ,, ,, ,, . . .	39°	42°	43°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 86 per cent.

Rain fell on 25 days, to the total depth of 4·05 in. (equivalent to about 19 gallons of water to the square yard). Heaviest fall on any day 0·59 in., on the 9th.

The prevailing winds were between south and west.

The average velocity of the wind was 10 miles an hour.

There were 95 hours of bright sunshine, equal to 26 per cent. of the greatest possible amount.

There were 10 days on which no sunshine was recorded.

April.—During the early part of this month there was but little improvement in the weather, which continued to be very windy and rainy, but towards the close of the second week a welcome change set in and the remainder of the month was quiet and dry, with warm days, followed by rather cool nights, and with an unusually large amount of sunshine. Under these conditions the ground quickly dried, and progress in gardening and farming operations again became possible. Regarding the month as a whole it was dry, the total rainfall being only a little more than half the average amount, and almost the whole of it fell within the first ten days. The amount of sunshine recorded at Wisley gave a daily average of over seven and a half hours, which is more than half the possible amount, supposing the sun to have shone uninterruptedly every day from sunrise to sunset; the only entirely sunless day was the closing day of the month, which

was very dull and cold, with a biting north-easterly wind. At Wisley the cold nights did harm to small and newly-planted things as well as to fruit blossom; and on the 26th, when the temperature on the ground fell to 20 degrees, potatos and Gunneras were injured. The *mean* temperature was above the normal all over the kingdom, and the month as a whole may be very fairly described as warm, dry, and sunny.

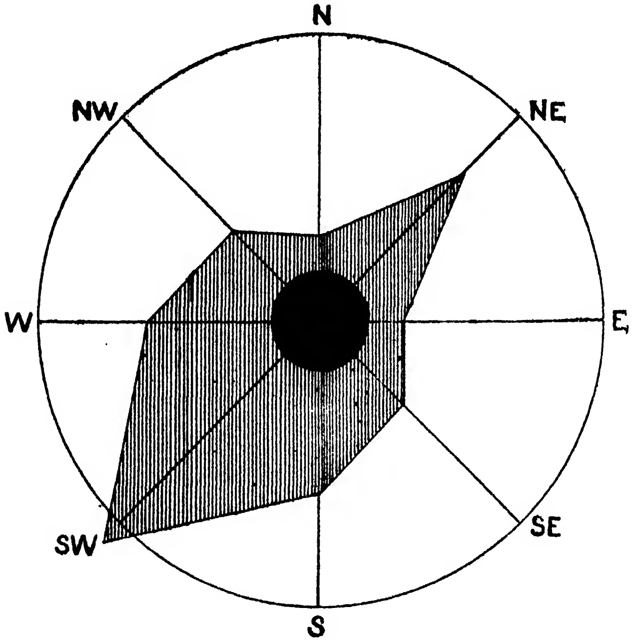

FIG. 39.—DISTRIBUTION OF WINDS AT WISLEY.
The central black disc indicates relative prevalence of calms.

The Wisley observations give the following results :—

Mean temperature of the air in shade	49·5°	
Highest ,, ,, ,, ,,	74°	on the 21st
Lowest ,, ,, ,, ,,	30°	,, 26th
Lowest ,, on the grass	19°	,, 16th
Number of nights of ground frost		21

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	48·3°	48·1°	46·6°
Highest ,, ,, ,, ,,	52°	51°	49°
Lowest ,, ,, ,, ,,	45°	46°	44°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 74 per cent.

Rain fell on 8 days, to the total depth of 0·91 in. (equivalent to about 4¼ gallons of water to the square yard). Heaviest fall on any day 0·22 in., on the 9th.

The prevailing winds were from south-west and north-east.

The average velocity of the wind was 7 miles an hour.

There were 299 hours of bright sunshine, equal to 56 per cent. of the greatest possible amount.

There was one day on which no sunshine was recorded.

May.—The only part of the British Isles which received more than its normal amount of rain this month was the eastern half of Scotland,

and even there the excess was a very moderate one; everywhere else the fall was below the normal amount, and at Wisley it did not exceed two-thirds of it. But the chief feature of the month's weather from a gardener's point of view was the frequent and very sudden changes of temperature, the transition from summer heat to winter cold,

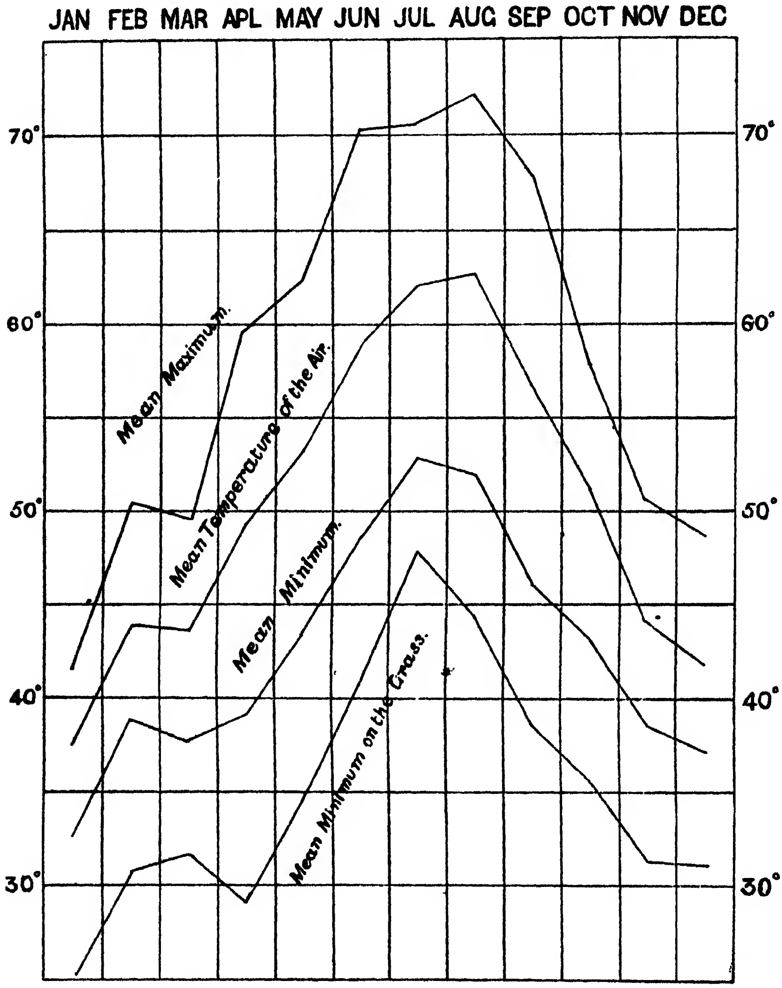

FIG. 40.—MEAN RANGE OF TEMPERATURE MONTH BY MONTH.

with frequent sharp night-frosts, which, in many instances, caused considerable injury to vegetation. Thus at Wisley the damage done by such a frost on the night of the 26th–27th was "disastrous, cutting back young growths of Ericas and shrubs, killing the leaders of conifers, cutting down potatos, beans, &c., and destroying most of the bloom of strawberries. Mulberries had every leaf and shoot killed, and bracken was cut down to the ground"; and similar

injury was caused over a very considerable area of the English Midlands. The mean temperature was upon the whole nearly normal; at Wisley it was one degree below it; but the month was broken up into periods; first one of normal warmth, then a rather cold one, followed by another of unusual warmth, and again one of equally unusual cold, thus affording a very good instance of the danger of placing too much confidence in *mean* values as representing weather conditions over a more or less lengthened period. There was a daily average of more than 6½ hours of bright sunshine. On the 7th there was a very sharp thunderstorm at Wisley, and similar storms were experienced in districts covering a wide area; but there were few strong winds, and no gales of importance throughout the month. The Wisley observations give :—

Mean temperature of the air in shade	52·7°	
Highest ,, ,, ,, ,, ...	80°	on the 22nd
Lowest ,, ,, ,, ,, ...	31°	,, 27th
Lowest ,, on the grass	19°	,, 27th
Number of nights of ground frost		14

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	53·1°	52·5°	51·2°
Highest ,, ,, ,, ,, ...	60°	56°	53°
Lowest ,, ,, ,, ,, ...	49°	50°	49°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 70 per cent.

Rain fell on 9 days, to the total depth of 1·07 in. (equivalent to about 5 gallons of water to the square yard). Heaviest fall on any day 0·26 in., on the 22nd.

The prevailing winds were north-easterly and south-westerly.

The average velocity of the wind was 6 miles an hour.

There were 210 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There was one day on which no sunshine was recorded.

June.—The weather throughout this month was that of a typical midsummer month, generally dry and fine, with an abundance of bright sunshine, a small amount of rain, and two or three thunderstorms. At Wisley there was no storm which could be described as severe; but over a portion of south-west London and the lower Thames Valley there was one, on the 14th, of quite unusual severity, that caused some loss of life, a considerable amount of structural damage, and heavy rain over a wide area, but amounting locally to a veritable deluge. It is of interest to record here that most of the loss of life was amongst those who had sought shelter beneath trees. But generally the total rainfall for the month was strikingly small; at Wisley it was only one-third of the average, and over a considerable area of southern England it did not exceed one-sixth of the normal fall. Sunshine, on the other hand, was very abundant, more than half of the possible amount being registered over a large part of the kingdom. At Wisley there was not a single day in the course of which the sun failed to leave some record, and the average daily amount was more than eight and a half hours. The mean temperature, also, was above the average over the greater part of the kingdom, and the close of the month was marked by some exceptionally warm days; but once or twice during the month the terrestrial radiation during the night

reduced the temperature near the ground sufficiently to damage bracken, French beans, vegetable marrows, and other tender plants.

The following table summarizes the Wisley observations :—

Mean temperature of the air in shade	59·1°		
Highest " " " "	85°	on the 30th	
Lowest " " " "	39°	" 8th	
Lowest " on the grass	29°	" 8th	
Number of nights of ground frost			2
	At depth of		
	1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	59·8°	58·0°	54·9°
Highest " " " "	66°	63°	58°
Lowest " " " "	55°	55°	53°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 70 per cent.

Rain fell on 10 days, to the total depth of 0·77 in. (equivalent to about 3½ gallons of water to the square yard). Heaviest fall on any day 0·20 in., on the 7th.

The prevailing winds were from north-east and south-west.

The average velocity of the wind was 3 miles an hour.

There were 259 hours of bright sunshine, equal to 53 per cent. of the greatest possible amount.

There were no days on which sunshine was not recorded.

July.—The exceptional heat which marked the closing days of June continued into July, and the opening of the month was characterized by the quite unusual temperature of 90 degrees at Wisley; and although such tropical conditions did not continue, yet fairly warm weather prevailed until the last week, when, under the influence of a more or less northerly air-current, it became decidedly cool for the middle of summer. The mean temperature for the month, at Wisley, was only half a degree below the average, and therefore, from the horticulturist's or agriculturist's point of view, the month was satisfactory as regards warmth. The rainfall also was only slightly in excess of the normal, and although a good many thunderstorms occurred in different parts of the kingdom, none of them was of exceptional severity. Bright sunshine was, however, somewhat deficient in many districts, and at Wisley it averaged only five and a half hours a day; but many days were practically sunless, and the general character of the month was decidedly cloudy and changeable.

The Wisley results are as follows :—

Mean temperature of the air in shade	61·8°		
Highest " " " "	90°	on the 1st	
Lowest " " " "	43°	" 29th	
Lowest " on the grass	35°	" 30th	
Number of nights of ground frost			None
	At depth of		
	1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	64°	63°	60°
Highest " " " "	68°	65°	61°
Lowest " " " "	60°	61°	58°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 75 per cent.

Rain fell on 13 days, to the total depth of 1·90 in. (equivalent to about 9 gallons of water to the square yard). Heaviest fall on any day 0·57 in., on the 12th.

The prevailing winds were from south-west and west.

The average velocity of the wind was 4½ miles per hour.

There were 174 hours of bright sunshine, equal to 35 per cent. of the greatest possible amount.

There was one day on which no sunshine was recorded.

August.—During the first week of the month the weather was unsettled and rainy, with rather low temperature for the season, conditions which were due to the existence of a shallow cyclonic disturbance over the Atlantic between Scotland and Iceland. With the final dispersal of this disturbance an improvement took place, and over the greater part of the kingdom the remainder of the month was warm, and in most places dry. In the extreme north, and also in Ireland and the south-west of England, there were occasional heavy falls of rain; but on the other hand a large portion of England suffered from drought, and at Wisley the total fall of rain was less than half the normal amount. Indeed, at Wisley the drought was the cause of much trouble; a great deal of fruit fell prematurely from the trees, and many shrubs that had been planted some years, and had become established, had to be frequently watered to keep them alive. But on the whole, from the agriculturist's point of view, the weather was ideal, and what was described as "bumper crops of wheat, potatos, beans, and hops" were harvested in excellent condition. Bright sunshine was nearly everywhere in excess of the average, and at Wisley its duration was nearly half the greatest possible amount. The results of the Wisley observations are given in the following table:—

Mean temperature of the air in shade	62·5°		
Highest " " " "	83°	on the	14th
Lowest " " " "	41°	"	18th
Lowest " on the grass	33°	"	18th
Number of nights of ground frost			None

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	62·4°	61·8°	59·6°
Highest " " " "	66°	64°	60°
Lowest " " " "	60°	61°	59°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 79 per cent.

Rain fell on 11 days, to the total depth of 1·03 in. (equivalent to about 4¾ gallons of water to the square yard). Heaviest fall on any day 0·44 in., on the 5th.

The prevailing winds were south-westerly.

The average velocity of the wind was 3 miles an hour.

There were 192 hours of bright sunshine, equal to 43 per cent. of the greatest possible amount.

There were two days on which no sunshine was recorded.

September.—The fine weather of the latter part of August continued into September, and, with the exception of a few days near the middle, the whole of this month was warm, bright, and dry. The unsettled interval was due to the passage eastward of centres of atmospheric disturbance over the northern parts of the kingdom, causing rain and strong winds from the westward over the whole of the British Isles; in some districts there were thunderstorms also, and locally some very heavy falls of rain. But notwithstanding this interlude the mean temperature for the month was a little above the average over the whole kingdom, and the recorded amounts of bright sunshine were also everywhere in excess of the usual amounts; at Wisley it exceeded an average of seven hours a day, which is more than half the greatest possible amount; and even in London the total

number of hours recorded was quite 50 per cent. above the average for September. The fall of rain was very small nearly everywhere, and the exceptions to this rule were almost all due to heavy downpours accompanying thunderstorms. At Wisley rain was measured only on seven days, and the total was less than half the average amount. Night-frosts were occasionally rather severe, and in the Gardens at Wisley Rhododendrons, Camellias, and other shrubs suffered damage in consequence.

The Wisley results are as follows :—

Mean temperature of the air in shade	56·9°		
Highest " " " "	81°	on the	7th
Lowest " " " "	30°	"	30th
Lowest " on the grass	21°	"	30th
Number of nights of ground frost			9

	At depth of 1 ft.	At depth of 2 ft.	At depth of 4 ft.
Mean temperature of the soil at 9 A.M.	58·4°	59·5°	58·9°
Highest " " " "	65°	63°	60°
Lowest " " " "	52°	56°	56°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 77 per cent.

Rain fell on 7 days to the total depth of 0·71 in. (equivalent to about 3¼ gallons of water to the square yard). Heaviest fall on any day 0·29 in., on the 10th.

The winds were variable in direction.

The average velocity of the wind was 5 miles an hour.

There were 213 hours of bright sunshine, equal to 57 per cent. of the greatest possible amount.

There were no days on which sunshine was not recorded.

October.—The warm, dry weather with which September closed continued until towards the end of October, by which time rain had become much needed. The temperature during the month was generally a little above the average, and maxima of over 60 degrees were frequent during the first half, whilst at Wisley the thermometer in the screen, four feet above the ground, only once fell so low as the freezing-point. But night-frosts occurred upon the ground several times, without, however, doing much harm, the principal trouble in gardens everywhere arising from the drought, which was general all over the kingdom. At Wisley only seven-hundredths of an inch of rain fell during thirty days, from the middle of September to the middle of October, and although the rain which fell subsequently was very beneficial to various autumn-flowering plants, yet deeper-rooted things still suffered from want of water. There were no gales, and as a rule very little wind anywhere. The weather was, however, dull, and curiously the latter part of the month, which was the wettest, was also the brightest ; a few favoured spots had more than the average amount of sunshine, but more generally the total recorded did not amount to three-fourths of the normal, and at Wisley only one quarter of the possible amount was recorded.

The Wisley records give the following results :—

Mean temperature of the air in shade	50·9°		
Highest " " " "	68°	on the	1st
Lowest " " " "	29°	"	12th
Lowest " on the grass	24°	"	28th
Number of nights of ground frost			11

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	51·9°	53·6°	54·5°
Highest " " " "	55°	56°	56°
Lowest " " " "	48°	51°	53°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain fell on 11 days, to the total depth of 1·50 in. (equivalent to about 7 gallons of water to the square yard). Heaviest fall on any day 0·43 in., on the 14th.

The prevailing winds were light and variable in direction.

The average velocity of the wind was 2 miles an hour.

There were 82 hours of bright sunshine, equal to 25 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded, and 7 on which the record was less than one hour.

November.—With the advent of November the character of the weather underwent a change, and instead of the quiet, mild, and dull conditions of October it now became windy and wet, but not cold; indeed, considering the time of the year, it was decidedly warm during the first half of the month, and then, after a colder interval, again mild until the month closed. During the first half the temperature at Wisley twice rose to 60 degrees, and in the screen it did not fall to 32 degrees, but during the cold snap the maximum never rose to 40 degrees, and at night the thermometer on the grass fell so low as 17 degrees, and Gunneras and other tender plants were cut down by the frost. Gales and strong winds were frequent, and brought with them a considerable amount of rain, so that the month was decidedly wet all over the kingdom, the excess at Wisley amounting to nearly 50 per cent. But notwithstanding the large rainfall and the cold spell it was a relatively bright month, and the amount of sunshine exceeded the average. At Wisley the total was 28 per cent. of the greatest possible amount, and, expressing it in another way, in London it was 50 per cent. more than the amount usually experienced in November.

The Wisley results are shown in the subjoined table:—

Mean temperature of the air in shade	44·6°	
Highest " " " "	60°	on the 3rd and 5th
Lowest " " " "	25°	" 18th
Lowest " on the grass	17°	" 18th
Number of nights of ground frost		8

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	44·9°	47·6°	50·4°
Highest " " " "	51°	52°	53°
Lowest " " " "	39°	44°	47°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 17 days, to the total depth of 3·08 in. (equivalent to about 14½ gallons of water to the square yard). Heaviest fall on any day 0·79 in., on the 15th.

The prevailing winds were south-westerly.

The average velocity of the wind was 7 miles an hour.

There were 72 hours of bright sunshine, equal to 28 per cent. of the greatest possible amount.

There were 8 days on which no sunshine was recorded.

December.—The most outstanding feature of the weather of the closing month of the year was the continuous, and generally heavy,

rainfall experienced all over the kingdom, the amount recorded in some parts of England being altogether without precedent during the period covered by reliable observation. The measurement of rainfall at the Greenwich Observatory covers a period of one hundred years, and there are many places in the kingdom where such measurements have been made for at least half that time, but in every instance the amounts now measured were from two to three and a half times the average for the month. This excessive precipitation in December followed upon a wet November, and it is not surprising that in the Thames Valley a large extent of land became flooded, nor that at Wisley practically all outdoor operations had to be suspended throughout the month. But besides being very wet the month was also stormy, and some of the gales were accompanied by heavy falls of rain, 1·80 inch being measured at the Gardens during a gale on the 9th, and half an inch during another on the 13th; but in East Surrey, on the high land to the south of Croydon, the amounts measured on these days were 2·1 inches and 1·1 inch respectively. Notwithstanding the rainfall the amount of bright sunshine recorded was generally above the average, although not to a very large degree. The first half of the month was rather warmer than usual, but this was somewhat balanced by the second half being rather cooler, and the mean for the whole month was 3 degrees above the average. In some districts there was fog, and towards the close of the month slight falls of snow, which quickly disappeared.

The mean results for Wisley are shown in the following table:—

Mean temperature of the air in shade	41·9°		
Highest " " " "	55°	on the	6th
Lowest " " " "	26°	"	25th
Lowest " on the grass	20°	"	23rd
Number of nights of ground frost			17

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	42·3°	44·4°	46·6°
Highest " " " "	48°	47°	48°
Lowest " " " "	37°	42°	45°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain fell on 23 days, to the total depth of 7·35 in. (equivalent to about 34½ gallons of water to the square yard). Heaviest fall on any day 1·80 in., on the 9th.

The prevailing winds were from between south and south-west.

The average velocity of the wind was 9 miles an hour.

There were 40 hours of bright sunshine, equal to 17 per cent. of the greatest possible amount.

There were 12 days on which no sunshine was recorded, and four others on which its total duration did not exceed five minutes.

* * * * * * *

The Meteorological Observatory in the Society's Gardens at Wisley was established in January 1904, and the foregoing yearly Report upon the results obtained there is therefore the eleventh which has been published in the JOURNAL. At the beginning a difficulty was experienced in finding any climatological observations which had been made in the near neighbourhood of Wisley, during a period sufficiently long to yield averages of temperature and rainfall, with

which the monthly means of the Wisley observations could be compared; but eventually several sets of observations of varying duration, and made at places lying in different directions and at varying distances from the Gardens, were secured, and from these, after careful comparison and consideration, a set of averages was deduced which it was hoped approximated fairly closely to the true average values for Wisley; and the monthly means published in these Reports have hitherto been compared with them.

But with the close of the year 1913 there became available observations made at the Gardens, under conditions carefully designed to secure accuracy, and extending over a period of ten years; and from them a new set of average values of temperature and rainfall have been calculated, and they have been used for the first time in preparing the Report for 1914. It is of interest now to see how closely these new averages agree with those hitherto used; and when it is remembered that the data previously available were very much of the nature of *disjecta membra*, from different localities and for various years, the agreement is rather remarkable.

As regards temperature, the difference between the two sets of monthly averages is less than half a degree in six of the twelve months, does not exceed one degree in two others, and is below two degrees in three of the remaining four. The greatest difference is 2·7 degrees in December, probably owing to an exceptionally cold year having been embraced in the earlier series. In almost every case the new Wisley averages are higher than the former set.

With regard to rainfall, bearing in mind the frequently local character of the phenomenon, and the wide variation in its intensity commonly found at places only a short distance from each other, a very close agreement was scarcely hoped for; nevertheless, in two months the two averages are alike; in six others the difference between them is less than half an inch; whilst in the remaining four months it lies between three-quarters of an inch and an inch. It is, however, somewhat curious that in the ten months which show differences between the two means the differences alternate regularly between minus and plus; *e.g.*, in May the new (Wisley) average total is 0·45 inch *less* than the total formerly used, whilst in June it is 0·32 inch more; and the result is that the new *yearly* total differs only 1·1 inch, or 4½ per cent., from the total formerly adopted. It is scarcely probable that observations of rainfall made at the same place, in two successive decennial periods, would show a closer agreement.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXV.—On the Influence of Planting-distance on the Yield of Crops.

By F. J. Chittenden, F.L.S.

The need for allowing a sufficient space about cultivated plants to permit them to develop properly is generally recognized, but the extent to which yield is affected by even the normal closeness of planting is, perhaps, rarely realized. The following figures, obtained in two series of experiments at Wisley in 1914, illustrate this point very clearly. All the figures obtained in the experiments are given; they are not selected examples, and are therefore the more convincing.

An investigation was being carried out into the effect of certain additions to the soil upon the yield of crops. The materials added need not be further particularized here, as the yield from the different plots is not brought into comparison, and they do not affect the point under discussion. The crop grown for the experiments was the turnip.

Series I.—The first of the two series of experiments comprised fifteen plots, each 33 feet long by 7 feet 6 inches broad, the plots running east and west and side by side.

Three rows of turnips were sown on each plot at the normal distance of 18 inches apart. The outer row of turnips on one plot was thus 4 feet 6 inches from the nearest outer row of the next plot. They were arranged in this manner in order to ensure that the influence of the manure supplied to one plot should not be felt by the plants on the next. The two outer rows on each plot had therefore a much greater open space on one side of them than on the other, while the middle row had plants close to it on each side.

This series was sown on May 25, 8·5 grams of 'Early White Stone' turnip being sown in each row. They were thinned on June 24, and pulled, counted, and weighed on July 29, the tops and roots free from soil being weighed separately. Table I. shows the average weight of both top and root of the plants from each of the three rows

separately on each of the fifteen plots, the heaviest row on each plot being called 100, the other weights being reduced in proportion.

TABLE I.—COMPARATIVE WEIGHTS FROM INDIVIDUAL ROWS IN SERIES I.

Plot.	Tops.			Roots.			Total weight.		
	Outer Row.	Middle Row.	Outer Row.	Outer Row.	Middle Row.	Outer Row.	Outer Row.	Middle Row.	Outer Row.
I.	77	58	100	89	76	100	80	64	100
II.	88	77	100	69	83	100	83	79	100
III.	93	96	100	76	92	100	87	94	100
IV.	100	77	100	100	80	91	100	78	100
V.	70	64	100	73	62	100	72	63	100
VI.	89	70	100	71	76	100	81	73	100
VII.	100	67	85	100	73	89	100	69	87
VIII.	88	85	100	91	97	100	89	89	100
IX.	100	82	96	100	83	93	100	83	96
X.	100	82	97	100	91	96	100	85	97
XI.	100	76	68	91	100	71	100	84	70
XII.	100	79	98	100	75	75	100	77	91
XIII.	96	79	100	100	78	96	99	79	100
XIV.	92	90	100	100	82	95	96	89	100
XV.	85	95	100	64	100	91	80	100	100

In two cases only (Plots XI. and XV.) the roots produced by the inner row were of a higher average weight than those of both of the corresponding outer rows; in no case did the average weight of tops from an inner row plant exceed the highest of the corresponding outer rows; and in only one case did the total average weight of a plant from the inner row equal that of the highest of the corresponding outer rows.

Series II.—The effect is seen to an even more marked extent in the second series of plots, where the plants were allowed to grow for a longer period and the roots to attain a larger size.

The second series comprised forty-four plots, each 13 feet by 9 feet. The same variety of turnip was sown on July 16 at the rate of 3 grams to each row, and the arrangement was in all things similar to that of the first series except that there were four rows 18 inches apart on each plot instead of three. There were thus two rows (Rows 2 and 3 in Table) closed in on each side, and two (Rows 1 and 4 in Table) separated by 4 feet 6 inches from the nearest row on the next plot, on each of the plots in the series.

These turnips were thinned on August 4, and grown on until September 28, when all were lifted, counted, and tops and roots free from earth weighed. The average weight of the plants from each row is set out in Table II., the heaviest row on each plot, as before, being taken as 100.

Perhaps the most satisfactory basis of comparison between the rows is afforded by the roots, for the weights of these give a fair idea

of the work done by the foliage during the growth of the plant, and they are not so liable to loss as is the foliage. In the case of the latter,

TABLE II.—SHOWING COMPARATIVE YIELD OF TURNIPS FROM EACH OF FOUR ADJOINING ROWS ON EACH OF 44 PLOTS.

Plot.	Tops.				Roots.				Totals.			
	Row 1	Row 2	Row 3	Row 4	Row 1	Row 2	Row 3	Row 4	Row 1	Row 2	Row 3	Row 4
A I.	100	67	57	90	100	72	56	93	100	71	57	92
II.	90	73	58	100	97	88	82	100	95	82	73	100
III.	100	77	49	82	100	83	75	96	100	80	64	90
IV.	100	80	60	86	93	86	70	100	100	88	70	98
V.	97	56	61	100	100	70	70	97	100	66	69	99
VI.	91	51	56	100	100	66	68	84	100	62	66	94
VII.	100	48	48	88	87	70	65	100	96	63	62	100
VIII.	100	66	42	80	100	63	66	94	100	65	57	92
IX.	70	75	65	100	92	67	67	100	85	71	67	100
X.	84	41	36	100	82	69	83	100	84	60	69	100
XI.	100	73	79	97	100	81	85	90	100	79	83	93
B I.	88	60	68	100	100	100	80	90	100	90	80	97
II.	89	62	48	100	100	55	61	91	100	57	57	94
III.	65	37	52	100	79	87	57	100	74	69	56	100
IV.	75	70	43	100	95	51	61	100	89	58	55	100
V.	100	65	47	88	90	81	68	100	97	79	63	100
VI.	91	74	57	100	100	73	61	79	100	76	61	87
VII.	90	66	70	100	88	96	88	100	89	87	82	100
VIII.	100	52	65	87	100	71	67	100	100	65	68	96
IX.	97	88	51	100	94	78	80	100	95	81	70	100
X.	100	88	66	85	100	86	71	94	100	91	82	94
XI.	100	48	48	77	100	62	58	78	100	56	53	72
C I.	100	67	67	96	100	64	76	92	100	69	78	92
II.	100	62	60	49	100	84	77	87	100	73	70	71
III.	90	60	100	100	88	77	80	100	98	79	97	100
IV.	73	66	78	100	84	73	56	100	85	74	68	100
V.	82	40	42	100	82	57	62	100	75	51	57	100
VI.	100	64	61	84	100	67	67	98	94	61	64	100
VII.	61	52	68	100	96	63	73	100	85	59	71	100
VIII.	72	62	69	100	100	70	91	93	93	61	86	100
IX.	87	58	68	100	100	70	68	93	100	69	67	100
X.	67	55	71	100	94	61	76	100	84	62	74	100
XI.	100	62	80	77	100	70	85	81	100	67	83	81
D I.	100	69	51	84	100	44	53	80	100	55	51	87
II.	100	68	82	100	100	59	63	78	100	69	73	91
III.	84	64	81	100	92	55	84	100	82	70	81	100
IV.	80	66	64	100	100	42	65	100	87	57	64	100
V.	63	54	47	100	77	40	77	100	68	48	56	100
VI.	90	100	86	96	90	43	53	100	92	81	76	100
VII.	100	65	73	84	100	58	86	100	100	63	76	89
VIII.	86	66	56	100	70	70	46	100	81	67	52	100
IX.	100	60	70	90	79	92	51	100	100	76	67	91
X.	100	45	54	94	100	77	63	96	100	51	61	95
XI.	88	51	76	100	96	63	96	100	90	55	81	100

the death of an occasional leaf on a plant here and there a few days before weighing is done interferes with the result to a rather marked extent. Table II. shows that in no case did the weight of roots from an inner row exceed that from one or other of the corresponding

outer rows, and in only six of the eighty-eight opportunities did it exceed that of the lower of the outer rows. Taking the combined weights of tops and roots, in only two plots did the total weight of an inner row exceed one or other of the corresponding outer rows, and in none was the highest yield given by an inner row. In every case but one (the foliage in Plot C II.) the lowest yield on the plot, whether of tops, roots, or total, was in an inner row.

Possibly the diagram given in figures 41 and 42 will emphasize even more clearly the influence of crowding on yield. The longer line in every case represents the average yield of all the plants in

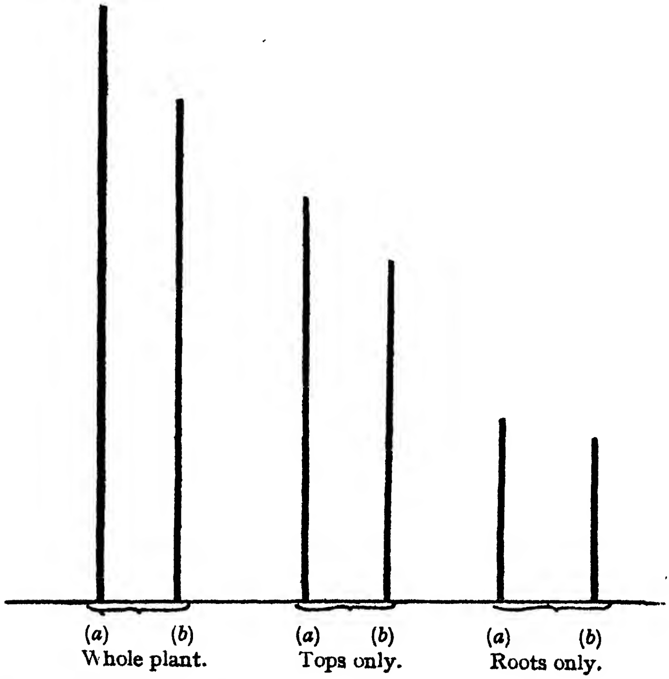

FIG. 41.—AVERAGE WEIGHTS OF TURNIPS IN (*a*) OUTER ROWS AND (*b*) INNER ROWS IN SERIES I. COMPARED.

the outer rows on the plots; the shorter, of all the plants in the inner rows on the plots. The first diagram (fig. 41) corresponds with Table I., the second (fig. 42) with Table II.

The first diagram (fig. 41) represents the comparison between (1) the average weights of the whole plants from the two outer rows (2,127 plants) and from the one inner row (1,086 plants); (2) average weight of the tops; and (3) average weight of the roots, in the first series of plots. In the same way the second diagram (fig. 42) represents the comparison between the average weights of (1) whole plant, (2) tops, (3) roots of 1,763 plants from the outer rows and 1,738 plants from the inner rows of the plots in the second series.

The diagrams are drawn to scale, and it is interesting and instructive

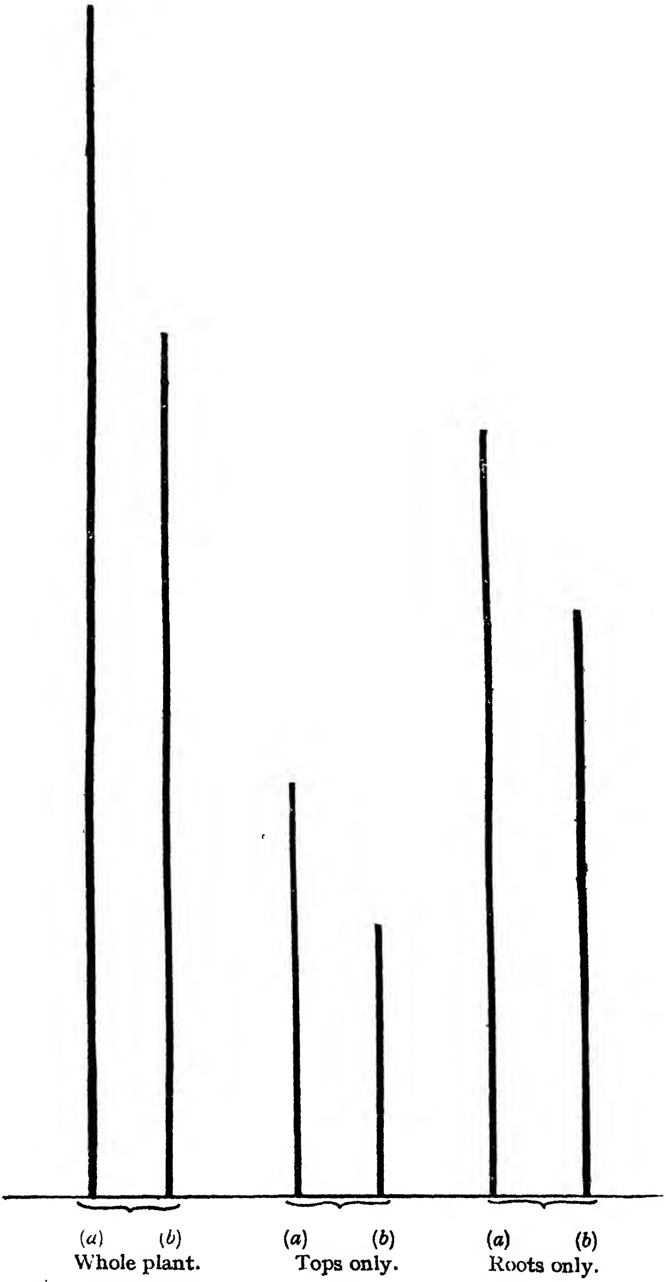

FIG. 42—AVERAGE WEIGHTS OF TURNIPS IN (a) OUTER ROWS AND (b) INNER ROWS IN SERIES II. COMPARED.

to observe the change in proportion of root to foliage as the plants advance in age. In the first diagram (fig. 42) the foliage outweighs

the roots, while in the second (fig. 42), where the plants were older and larger, the roots outweigh the foliage.

The total weight of the turnips (with foliage) from the fifteen plots in Series I. was 1651 lb., from the forty-four plots in Series II. 3,338 lb.

The figures and diagrams make perfectly clear the detrimental influence exercised by close planting upon yield, even when the planting is done at what is regarded as the normal distance.

It is also clear that when comparisons are being made between yields of varieties, the plots (or rows) must be arranged so that none of the rows (or plants) to be compared has an advantage of space over its fellows. Perhaps the best method of estimating yield is to discard all plants on the outside of the plot, whether forming an outer row or placed at the end of a row.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXVI.—The Effect of Manganese Sulphate on the Yield of Turnips at Wisley.

By F. J. Chittenden, F.L.S.

During recent years reports of increased yield following the addition of small quantities of manganese sulphate to the soil have been received, and it was thought desirable to try the effect of this substance on the soil at Wisley. Messrs. Pickles kindly supplied some for the purpose, and the following trial was made.

We publish the results obtained so as to put them on record without discussing their significance. Salts of manganese are not, as a rule, regarded as materials of which the plant can make use, and the action of manganese in the soil is by no means understood. The results at Wisley suggest the desirability of further investigation, for it seems evident that under certain conditions (at present not definitely known) manganese sulphate may exert a beneficial effect, but at the same time it should be pointed out that in many places a lessened crop has followed its application. It is possible that it acts by promoting certain chemical reactions in the soil, either directly or indirectly, and in that case its effects are likely to vary according to the nature of the chemical constituents of the soil to which it is added. Until its action is better understood it would be premature to recommend its use except on an experimental scale.

The trial was carried out on the ordinary cultivated soil of the vegetable quarters at Wisley without manuring in 1914, except as set out in the table. There were four plots in the series, and these were in triplicate (twelve plots in all). The plots, each 7 feet 6 inches wide and 33 feet long, were set out side by side, and on each, after the addition of the substances mentioned below and suitable cultivation, three rows of 'Early White Stone' turnip were sown 18 inches apart, an equal weight of seed being sown in each row. The distance from the outer row of one plot to the nearest row on the next was thus 4 feet 6 inches, so that the influence of the treatment of one plot would not be felt by the plants on the next.

The quantity of manganese sulphate added was 150 grams on each plot to which it was applied (= 70 lb. to the acre which Messrs. Pickles suggested as a maximum dressing), of peat 11 lb., and of lime 11 lb.

The seed was sown on May 26, 1914; the plants were thinned on June 24; and the crop was lifted and weighed on July 29, with the following results:

TABLE I.

	Plot.	Additions made.	No. of plants.	Total and average weight.	Total and average wt. of tops.	Total and average wt. of roots.
				lb.	lb.	lb.
Series 1.	I.	Nothing . . .	263	123·5 *·48*	81·5 *·32*	42 *·16*
	III.	Manganese sulphate and peat . .	207	134 *·64*	89·75 *·43*	44·25 *·21*
	IV.	Manganese sulphate .	221	122 *·55*	78 *·35*	44 *·20*
	V.	Manganese sulphate and lime . .	222	126·5 *·56*	86 *·37*	40·5 *·18*
Series 2.	VI.	Nothing . . .	239	128 *·53*	81·5 *·34*	46·5 *·19*
	VIII.	Manganese sulphate and peat . .	197	118·25 *·60*	79·25 *·40*	39 *·19*
	IX.	Manganese sulphate	204	105 *·51*	70·25 *·34*	34·75 *·17*
	X.	Manganese sulphate and lime . .	212	106·5 *·51*	75·75 *·37*	30·75 *·15*
Series 3.	XI.	Nothing . . .	186	75·5 *·41*	53·75 *·27*	21·75 *·14*
	XIII.	Manganese sulphate and peat . .	185	90 *·49*	61 *·33*	29 *·16*
	XIV.	Manganese sulphate .	201	89 *·44*	63 *·31*	26 *·13*
	XV.	Manganese sulphate and lime . .	214	84·75 *·39*	59·75 *·27*	25 *·12*

Owing to losses of plants from various causes, there was some variation in the number of plants harvested, and to bring the figures more into line the average weight of plants, foliage, and roots is given in italics under the gross weight from the plot in the foregoing table.

In each set of plots the plot to which nothing was added gave a lower yield than that to which manganese sulphate and peat were added; in two out of the three cases manganese sulphate alone increased the yield, while the addition of lime to the manganese sulphate depressed the yield of roots again.

We may add the yields of three plots having similar treatment together, and the result is set out in Table II.

TABLE II.

Plots.	Additions made.	No. of plants.	Total wt. and average wt.	Total and average wt. of tops.	Total and average wt. of roots.
			lb.	lb.	lb.
I. VI. XI.	Nothing . .	688	327 ·47	216·75 ·31	110·25 ·16
III. VIII. XIII.	Manganese sulphate and peat . .	589	342·25 ·58	230 ·39	112·25 ·19
IV. XI. XVI.	Manganese sulphate	626	316 ·5	211·25 ·33	104·75 ·17
V. X. XV.	Manganese sulphate and lime . .	648	317·75 ·49	221·5 ·34	96·25 ·15

The "nothing" plots therefore gave the least return, the addition of manganese sulphate increased the return, while this increase was emphasized when peat also was added, and depressed when lime was added in conjunction with manganese sulphate. The increase was only 6 per cent. in the case of the manganese alone, 21 per cent. with manganese and peat, and only 4 per cent. with manganese and lime.

It may be added that peat alone gave no increase of crop on the average.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXVII.—COMPARISON OF THE GROWTH OF APPLE TREES PRUNED AND NOT PRUNED IN THE SEASON OF PLANTING.

By F. J. CHITTENDEN, F.L.S.

Introduction.—Most of the older writers on fruit-growing appear to contemplate the planting of trees in the orchard with but one year's growth from the bud or graft, and only rarely the transplanting of older trees, and the directions they give, except when they deal with principles, are not always clear in their application to trees of two, three, or more years' growth. In LONDON and WISE's abridgment of DE LA QUINTINEY's great work,* for instance, the point is thus treated: "There are two things to be prepar'd in planting of a Tree, viz. the *Head* and the *Root.* As to the *Head,* there is but little mystery in ordering that, either in *Standard* or *Dwarf Trees*; it being needful only to remember these two Points.

"*First,* as we prejudice a *Tree* when we pluck it up, by weakening it thereby, and abating its vigour and activity for some time; so we must therefore disburthen its *Head,* proportionable to the strength and activity we take from it by recovering it to a new place, and retrenching some of its *Roots.*

"*Secondly,* we must be mindful to leave its *Body* no higher than is convenient for the use the *Tree* is design'd for. . . ."

DE LA QUINTINEY evidently contemplated pruning the head as well as the roots *before* planting, and he considers the balance of root and shoot, and the training of the tree. The latter is of the utmost importance in all trees in their nursery stages, and cannot be neglected even when trees of three or four years of age are planted, while the former principle has led to some discussion and to difference in practice during later years. DE LA QUINTINEY advocated the removal of all the fibrous roots, a proceeding which SWITZER † a few years later considered to be uncalled for when a tree was lifted with a good ball and immediately replanted. SWITZER, too, did not prune the tops of his trees at the planting time (September to November), for he writes: "We don't prune the Head till the cold Times and Frosts

* DE LA QUINTINEY, M., *The Complete Gard'ner. . . . Now Compendiously Abridg'd, and made of more Use, with very considerable Improvements.* By GEORGE LONDON and HENRY WISE. Ed. 6 (1717), pp. 102, 103.

† SWITZER, S., *The Practical Fruit Gardener* (1724), p. 68 *et seq.*

are past, for that Trees are apt to die after the knife down to the next Bud, which is an eye-sore to the Tree, and is very prejudicial in its consequences to the shape, beauty, and well doing of it." SWITZER's trees were maidens.

Subsequent writers gave varying advice on the pruning of newly-planted trees; some followed DE LA QUINTINEY, some SWITZER, while others ignored the question, and some advised that pruning should be done only in special cases.

T. S. D. BUCKNALL * deprecated pruning in the season of planting, preferring that it should be done in the nursery " the year before they are to be planted " ; for, " from this forecast, the trees will not require pruning for some time, and, having no wounds to heal the year they are transplanted, will greatly accelerate their growth."

T. ANDREW KNIGHT, as might be expected, advocated it.† He writes: " The branches of the trees, when removed, whether grafted or not, and wherever planted, should be much retrenched." But only a few years afterwards HARRISON ‡ says, in dealing with planting: " In respect to pruning the tops of young trees, I never do it at the time of planting them (unless they are sickly), providing they are planted in autumn, but if they be planted in spring, and that season far advanced, it will then be necessary."

This difference in practice has continued down to the present day,§ and both pruning in the season of planting and the postponement of the operation till after a season's growth find advocates, each of whom gives reasons which have at least some backing in the facts of plant physiology, and points with pride to instances of successful results following the adoption of the plan he upholds. Theoretically the balance appears to be in favour of reducing the top so as to reduce the demand upon the curtailed roots for water, but when practice is at variance and good results follow from both methods it is probable that the circumstances under which these results were obtained were not quite the same. The writer knew of no carefully carried out comparative measurements of growth of trees pruned in the season of planting with those left unpruned, and in planning a somewhat extensive experiment on summer pruning the opportunity was made to include trees enabling this comparison to be made.

The Plan of the Experiment.—The experiment was designed to ascertain (1) whether varieties of apple having different growth-characters responded differently in respect to their treatment after planting, and (2) whether the use of different stocks made any difference in this respect.

All the trees used in the experiment were budded from the trees

* BUCKNALL, T. S. D., *The Orchardist: or, a System of Close Pruning and Medication* (1797), p. 35.

† KNIGHT, T. A., *A Treatise on the Culture of the Apple and Pear*, Ed. 4 (1813), p. 79.

‡ HARRISON, C., *A Treatise on the Culture and Management of Fruit Trees* (1823), p. 26.

§ See for instance LANSDELL, J., " On Pruning Trees after Planting," *Journal R.H.S.* xxxv., p. 384 (1910).

in the Wisley orchard in the summer of 1908 (or grafted in spring 1909), some on Paradise stock, some on Crab stock. The Paradise stocks were a fairly uniform lot of what is known as Broad-leaved Paradise; the Crab stocks showed the usual variations which stocks raised from seed always show, but the weakest-growing ones were rejected. Crab stocks always show much variation in vigour, but on the whole tend to produce more quickly-growing trees than those worked upon broad-leaved Paradise stock.

The trees received the usual treatment of nursery stock, being trained to produce bushes. They were planted in their permanent quarters when three years old, in open weather in early January 1912, in well-prepared sandy loam at the southern end of the field then known as "Howard's." The plan (fig. 43) shows their disposition. The trees of each variety and stock were as nearly as possible of the same size in the two comparable rows, and all were planted in ample holes according to orthodox methods.

The trees of each variety were planted in two adjoining rows, one row being pruned at the end of March, the other being left unpruned. The varieties chosen showed different growth-characters, those worked on Paradise stock being 'Ribston Pippin' (ten trees, Nos. 701–10), 'Peasgood's Nonesuch' (ten trees, Nos. 711–20), 'Ecklinville Seedling' (five trees, Nos. 741, 744, 746–8), 'Duke of Devonshire' (five trees, Nos. 742, 743, 745, 749, 750), 'Newton Wonder' (ten trees, Nos. 751–60); those on Crab stock, 'Ribston Pippin' (five trees, Nos. 721–3, 726, 728), 'Christie Manson' (four trees, Nos. 724, 725, 729, 730), 'Peasgood's Nonesuch' (ten trees, 731–40), 'King of the Pippins' (ten trees, Nos. 761–770), 'Mr. Gladstone' (ten trees, Nos. 771–780).

The treatment of each tree can be seen from the Tables, and their exact positions by comparing the Tables with the plan. They were planted ten feet apart each way.

After growth had ceased in the autumn of each of the three years which have elapsed since planting, the length of each branch and twig produced during the previous growing season was measured, and the sum of these measurements for each year is given in the Tables for each tree. After the measurements had been completed each season all the trees were pruned in order to give them the form desired, and to admit light to the middle of the trees, each tree being treated according to its requirements in these directions. The first general pruning was done in February 1913.

Results Obtained.—At that time it was evident that the trees which had not been pruned after planting had far more flower-buds upon them than had those which had been pruned. So marked was this that it was in most cases difficult to find shoot-buds to which to prune, and consequently pruning had to be done into the two-year-old wood made in 1911, instead of, as a rule with those pruned after planting, that made in 1912. This was the case in every variety, so that although in every case the amount of growth made in 1912 was greater in the

701 •	702 •	703 •	704 •	705 •
706 ×	707 ×	708 ×	709 ×	710 ×
711 •	712 •	713 •	714 •	715 •
716 ×	717 ×	718 ×	719 ×	720 ×
721 •	722 •	723 •	724 •	725 •
726 ×	727 ×	728 ×	729 ×	730 ×
731 •	732 •	733 •	734 •	735 •
736 ×	737 ×	738 ×	739 ×	740 ×
741 •	742 •	743 •	744 •	745 •
746 ×	747 ×	748 ×	749 ×	750 ×
751 •	752 •	753 •	754 •	755 •
756 ×	757 ×	758 ×	759 ×	760 ×
761 •	762 •	763 •	764 •	765 •
766 ×	767 ×	768 ×	769 ×	770 ×
771 •	772 •	773 •	774 •	775 •
776 ×	777 ×	778 ×	779 ×	780 ×

FIG. 43.—DIAGRAM SHOWING ARRANGEMENT OF TREES ON PLOT.

The dots represent the Trees pruned in the season of planting, the crosses those not pruned. The numbers are referred to in the text. The space between the Trees is ten feet each way.

pruned than in the unpruned trees, the amount of wood removed at pruning time was greater in every case in the unpruned than in the pruned trees. This is shown in the following Table.

TABLE I.—WEIGHT OF WOOD REMOVED IN PRUNING IN FEBRUARY 1913.

Variety.	No.	Treatment after planting.	Average weight of prunings.
			grammes.
'Ribston Pippin' .	701–5	Pruned	39
,, ,, . .	706–10	Not pruned	60·2
'Peasgood's Nonesuch'	711–15	Pruned	45·8
,, ,, . .	716–20	Not pruned	88
'Ribston Pippin' .	721–3	Pruned	26·3
,, ,, . .	726, 728	Not pruned	63·5
'Christie Manson' .	724, 725	Pruned	51
,, ,, .	729, 730	Not pruned	126
'Peasgood's Nonesuch'	731–5	Pruned	58·2
,, ,, .	736–40	Not pruned	150·4
'Ecklinville Seedling'.	741, 744	Pruned	47
,, ,, .	746–8	Not pruned	70
'Duke of Devonshire'	742, 743, 745	Pruned	46
,, ,, .	749, 750	Not pruned	97
'Newton Wonder' .	751–5	Pruned	46·8
,, ,, .	757–60	Not pruned	95·8
'King of the Pippins'	761–5	Pruned	57·8
,, ,, .	766–70	Not pruned	127
'Mr. Gladstone' .	771–5	Pruned	18·8
,, ,, . .	776–80	Not pruned	29·6

As the first thing to be aimed at after planting is to lay the basis of sound well-grown trees, none was allowed to fruit in 1912, and they are not yet old enough to give reliable comparative records of fruit production. Comparative growth alone is dealt with in this report.

The following Tables (II.–XI.) show for each variety and stock the amount of growth made in each year (1912–14) by each tree, the total growth of the trees which received similar treatment, and the average growth of the trees of each variety and stock pruned in the season of planting, side by side with those of the same variety and stock not so pruned.

TABLE II.—'RIBSTON PIPPIN' ON PARADISE STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
701	17	0	38	2	70	0	706	9	2	39	6	91	0
702	13	2	39	10	85	0	707	7	6	34	0	75	0
703	13	0	37	0	66	0	708	13	4	44	6	84	0
704	16	8	49	0	102	0	709	4	11	29	0	37	6
705	16	1	37	5	79	0	710	7	5	37	6	62	0
Total growth	75	11	201	5	402	0	Total growth	42	4	184	6	349	6
Average growth of five trees	15	2½	40	3½	80	4½	Average growth of five trees	8	3½	36	10½	69	11

In the first season the average growth made by the pruned trees was nearly double that of the unpruned ones, and in each succeeding season it has been somewhat in excess. Bearing in mind that after the growth of 1912 the five trees not pruned after planting (Nos. 706–10) had to be more severely pruned than the others, it is obvious that Nos. 701–5 are now considerably larger, on the average, than Nos. 706–10.

TABLE III.—'PEASGOOD'S NONESUCH' ON PARADISE STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
711	18	9	40	8	73	3	716	11	8	25	11	41	0
712	14	9	38	9	100	8	717	7	2	24	4	46	0
713	8	11	20	8	55	0	718	6	10	37	0	42	0
714	17	6	32	1	61	3	719	9	0	24	6	51	0
715	11	1	21	3	43	6	720	9	9	32	0	102	10
Total growth	71	0	153	5	333	8	Total growth	44	5	143	9	282	10
Average growth of five trees	14	2⅕	30	8	66	9	Average growth of five trees	8	10½	28	9	56	7

The trees of this variety on Paradise stock show precisely the same phenomena as do those of 'Ribston Pippin' in Table II.

TABLE IV.—' RIBSTON PIPPIN ' ON CRAB STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
721	16	8	38	0	87	11	726	8	8	30	0	86	3
722	8	11	23	6	80	6	728	11	0	40	0	110	9
723	11	9	32	3	82	0							
Total growth	37	4	93	9	250	5	Total growth	19	8	70	0	197	0
Average growth of three trees	12	5½	31	3	83	6	Average growth of two trees	9	10	35	0	98	6

In this case the growth of the pruned trees in the first year was in excess of that of the unpruned, but to a less marked extent than in the trees of the same variety on Paradise stock, while in the second and third years the trees which were not pruned after planting slightly outpaced those which were pruned, so that at the present time there is little difference in the two sets.

TABLE V.—' CHRISTIE MANSON ' ON CRAB STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
724	20	4	48	9	146	2	729	9	9	42	6	108	0
725	10	10	37	6	52	0	730	17	11	37	0	112	0
Total growth	31	2	86	3	198	2	Total growth	27	8	79	6	220	0
Average growth of two trees	15	7	43	1½	99	1	Average growth of two trees	13	10	39	9	110	0

These trees show results similar to those in Table IV. on Crab stock, except that the slight superiority in growth of the pruned over the unpruned was maintained into the second season.

The results given by ' Peasgood's Nonesuch ' on Crab as set out in Table VI. below contrast with those given by the same variety on Paradise (Table III.). The difference in growth between the two sets in the first season was in favour of pruning in the season of planting in both cases, but far less markedly so with the trees on Crab stock,

while in these in the second year the superiority was all on the side of not pruning in the season of planting, a superiority which is well maintained into the third year.

TABLE VI.—'PEASGOOD'S NONESUCH' ON CRAB STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
731	21	10	40	0	70	0	736	15	0	48	7	117	0
732	22	6	33	0	85	6	737	17	0	65	10	122	0
733	19	2	35	0	85	8	738	16	4	65	6	120	9
734	11	8	42	0	127	0	739	15	10	74	2	99	0
735	19	6	39	0	79	6	740	13	2	48	2	91	6
Total growth	94	8	189	0	447	8	Total growth	77	4	302	3	550	3
Average growth of five trees	18	11	37	10	89	6	Average growth of five trees	15	6	60	5	110	1

TABLE VII.—'ECKLINVILLE SEEDLING' ON PARADISE STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
741	17	1	47	0	90	9	746	10	3	53	0	74	2
744	18	5	57	0	71	1	747	8	0½	36	0	66	0
							748	10	7	47	6	75	0
Total growth	35	6	104	0	161	10	Total growth	28	10½	136	6	215	2
Average growth of two trees	17	9	52	0	80	11	Average growth of three trees	9	7½	45	6	71	9

The amount of growth made by the pruned trees was much greater than that of the unpruned trees in the first year after planting, and greater, though less markedly so, in each of the two following years.

TABLE VIII.—'DUKE OF DEVONSHIRE' ON PARADISE STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
742	17	3	42	6	65	0	749	9	11	33	4	70	6
743	13	2	44	0	38	3	750	11	3	30	2	54	0
745	21	2	52	0	98	0							
Total growth	51	7	138	6	201	3	Total growth	21	2	63	6	124	6
Average growth of three trees	17	2	46	2	67	1	Average growth of two trees	10	7	31	9	62	3

The results obtained with this variety on Paradise stock are in every way similar to those given by 'Ecklinville Seedling' on the same stock.

TABLE IX.—'NEWTON WONDER' ON PARADISE STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
751	13	0	44	6	69	3	756	7	10	21	10	48	0
752	17	8	47	6	103	6	757	5	10	24	6	40	0
753	13	2	44	6	85	10	758	5	5	29	0	60	3
754	12	9	36	3	67	0	759	7	3	23	8	37	6
755	7	0	20	6	38	6	760	6	1	20	0	40	0
Total growth	63	7	183	3	364	1	Total growth	32	5	119	0	225	9
Average growth of five trees	12	8½	36	8	72	10	Average growth of five trees	6	6	23	10	45	2

'Newton Wonder' on Paradise stock has given results similar to those shown in the last two Tables, but even more marked than they gave, greatly in favour of pruning in the season of planting, the increased growth being evident in each of the three years which have elapsed.

TABLE X.—'KING OF THE PIPPINS' ON CRAB.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
761	22	9	51	0	129	0	766	8	9	61	11	84	0
762	17	9	36	0	54	0	767	14	3	82	10	128	6
763	17	11	48	0	77	0	768	10	9	42	0	51	9
764	13	0	38	0	43	0	769	7	7	37	4	55	6
765	9	9	21	0	44	3	770	7	0	34	0	32	2
Total growth	81	2	194	0	347	3	Total growth	48	4	258	1	351	11
Average growth of five trees	16	3	38	9	69	5	Average growth of five trees	9	8	51	7	70	5

With 'King of the Pippins' on Crab, the growth of the pruned trees in the first year was considerably greater than that of the unpruned, but in the second year the balance was on the other side, and in the third the amount of growth in the two sets was about equal.

TABLE XI.—'MR. GLADSTONE' ON CRAB STOCK.

Trees pruned season of planting.							Trees not pruned season of planting.						
Tree No.	Growth made in—						Tree No.	Growth made in—					
	1912.		1913.		1914.			1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.		ft.	in.	ft.	in.	ft.	in.
771	19	6	42	2	71	0	776	8	4	14	0	28	6
772	7	4	28	3	54	2	777	3	11	18	0	26	0
773	10	0	22	0	48	8	778	8	2	37	10	95	0
774	5	9	30	6	41	9	779	5	9	14	1	27	9
775	3	4	12	6	25	0	780	6	5	32	7	65	0
Total growth	45	11	135	5	240	7	Total growth	32	7	116	6	242	3
Average growth of five trees	9	2	27	1	48	1	Average growth of five trees	6	6	23	3	48	5

'Mr. Gladstone' on Crab stock gave about 40 per cent. more growth among the pruned than among the unpruned trees in the first year, slightly more in the second, but the two sets were about equal in growth in the third year. It is perhaps to be expected that this variety would differ somewhat from the others in its results, on account of its great tendency to form fruit buds at the tips of the long shoots.

Table XII.—Comparison of Difference in Average Annual Growth of Trees Pruned and Unpruned in Season of Planting on Paradise and on Crab Stock.

Trees on Paradise Stock.

Variety.	Treatment, March 1912.	Average growth. 1912. ft.	in.	1913. ft.	in.	1914. ft.	in.	Relative growth. 1912.	1913.	1914.
'Ribston Pippin'	Pruned	15	2½	40	3½	80	4½	184	109	115
	Not pruned	8	3½	36	10½	69	11	100	100	100
	Percentage difference							+84*	+ 9	+15
'Peasgood's Nonesuch'	Pruned	14	2½	30	8	66	9	162	108	119
	Not pruned	8	10½	28	9	56	7	100	100	100
	Percentage difference							+62	+ 8	+19
'Ecklinville Seedling'	Pruned	17	9	52	0	80	11	184	114	113
	Not pruned	9	7½	45	6	71	9	100	100	100
	Percentage difference*							+84	+14	+13
'Duke of Devonshire'	Pruned	17	2	46	2	67	1	169	145	108
	Not pruned	10	7	31	9	62	3	100	100	100
	Percentage difference							+69	+45	+ 8
'Newton Wonder'	Pruned	12	8½	36	8	72	10	195	154	161
	Not pruned	6	6	23	10	45	2	100	100	100
	Percentage difference							+95	+54	+61

Trees on Crab Stock.

Variety.	Treatment, March 1912.	Average growth. 1912. ft.	in.	1913. ft.	in.	1914. ft.	in.	Relative growth. 1912.	1913.	1914.
'Ribston Pippin'	Pruned	12	5½	31	3	83	6	126	93	86
	Not pruned	9	10	35	0	98	6	100	100	100
	Percentage difference							+26	− 7	−14
'Christie Manson'	Pruned	15	7	43	1½	99	1	112	108	90
	Not pruned	13	10	39	9	110	0	100	100	100
	Percentage difference							+12	+ 8	−10
'Peasgood's Nonesuch'	Pruned	18	11	37	10	89	6	122	62	81
	Not pruned	15	6	60	5	110	1	100	100	100
	Percentage difference							+22	−38	−19
'King of the Pippins'	Pruned	16	3	38	9	69	5	170	75	98
	Not pruned	9	8	51	7	70	5	100	100	100
	Percentage difference							+70	−25	− 2
'Mr. Gladstone'	Pruned	9	2	27	1	48	1	141	117	99
	Not pruned	6	6	23	3	48	5	100	100	100
	Percentage difference							+41	+17	− 1

* The plus sign (+) means % excess growth of pruned trees; the minus sign (−) means % by which growth of pruned trees fell short of trees not pruned in season of planting.

One thing stands out quite clearly from the figures in Tables II. to XI.—the greater growth produced in their first year by apples pruned in the season of planting compared with those of the same age and size, and of the same variety, on the same stock not so pruned. Variety appears to make little difference in the result, either in that year or in the two years succeeding.

In Table XII. the average growth of the different sets of trees is brought together.

This Table clearly indicates that the kind oi stock used makes a difference in the results, for while the average growth was in all cases greater in the first year in the trees pruned in the season of planting than in those not pruned, the average increase (79 per cent.) shown among the trees on Paradise stock is far greater than in the trees on Crab stock (34 per cent.). The results would perhaps be more satisfactory if each variety tried had been represented on both stocks, but in the two cases of 'Ribston Pippin' and 'Peasgood's Nonesuch' where this comparison can be made the contrast is remarkably striking.

In the second year, among the trees on Paradise stock, in every case there was a greater growth on the trees pruned in the season of planting than on the others, but the difference was far less marked than in the first season, the average difference being 26 per cent., while in the third year the same difference held a little less strongly in some varieties, a little more in others (23 per cent.).

Turning to the second year's record of the trees on Crab stock, we find in three out of the five varieties greater average growth in the trees not pruned in the season of planting, in some cases much greater growth, so that the average growth of the trees on Crab stock pruned in the season of planting fell behind the others by 9 per cent., while in the third year in every case the average growth of the trees pruned in the season of planting fell somewhat behind those not pruned (9 per cent.), but was generally more nearly equal.

The results obtained by the experiment lead to the conclusion that all varieties of apples grow better in the first season, if they are pruned in the season of planting, than if left unpruned, and that the check imposed by neglect of pruning is felt by trees on Paradise stock for at least three years after planting, while trees on Crab stock appear to recover more quickly, and perhaps even to gain slightly in their second and third years.

The majority of apple-trees are now grown as dwarfs on Paradise stocks, and, bearing in mind the need for speedily laying a good foundation for a sound tree, the importance of pruning these in the season of planting is clearly indicated. Trees on Crab stock apparently show a greater power of recovery from the check, but even with these the first year's *growth* is important, and is not likely to be recovered

in the next year even if the growth of the trees unpruned in the first season exceeds those pruned, as Table I. indicates. This suggests that these too should be pruned in the season of planting.

The difference in behaviour of the trees on different stocks gives a probable explanation of the difference which has arisen in practice, and shows that in the long run the advocates of leaving pruning till the second year may be justified by the trees doing at least nearly as well as if pruned in the season of planting if they are dealing with trees on Crab stock.

The question of the *best time* to prune is not dealt with here, and no doubt depends greatly upon weather conditions.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXVIII.—The Control of Peach Leaf Curl.

By A. S. Horne, D.Sc., F.G.S., F.L.S.

During the last few years the outdoor peaches and nectarines at Wisley have suffered considerably from leaf curl due to the fungus *Exoascus deformans* (Berkeley) Fuckel, and to such an extent that only a small percentage of leaves remained entirely unaffected. *Exoascus* curl is an ancient scourge and much has been written about it, nevertheless it is still prevalent in Europe and Asia, but South Australia, New Zealand, and the United States claim to have brought it under control.

The symptoms are well known and various figures have appeared in this Journal and elsewhere.* The disease appears in spring, soon after the foliage buds unfold, affecting the very young leaves, which exhibit a tendency to curling and crumpling and are tinged in the affected areas with pink. As the leaves become mature the curling and crumpling are more pronounced, and the tissue becomes fleshy and the coloration of darker hue. The affected leaves fall prematurely. As a result the tree is rendered unsightly, and, more important still, the process of nutrition is seriously hampered owing to the injury to and subsequent loss of so many leaves ; this results in poor productivity, fruit remaining small and failing to ripen even when the conditions are good for ripening. G. Arnaud records that the parasite also attacks the young branches, flowers, and fruit. The diseased branches are deformed and often curved. When the flowers or fruit are attacked they die and fall; rarely the fruit grows for a time and develops deformities.

In winter, symptoms of fungous activity appear in the young growth, brown patches being present here and there on the young laterals ; these patches increase in size and local death ensues, upon which the whole length of the lateral beyond this point withers and perishes. In this way the fungus is the cause of many dead ends, which have to be removed in spring.

According to Massee, the mycelium of *Exoascus* hibernates in the bark, medullary rays, and pith of young shoots, and extends along the growing parts, from which it passes into the leaf buds and infects the leaves each succeeding season, its activity synchronizing with the renewal of plant vigour in spring.

Arnaud, whilst admitting the possibility of this mode of behaviour, is strongly of opinion that this manner of infection is not of importance,

* See e.g., *Journal R.H.S.* 28, p. 16; *Gardeners' Chronicle*, July 9, 1887, fig. 13, and May 13, 1905, fig. 121, Massee's *Text Book of Plant Diseases*, and elsewhere. Excellent figures by G. Arnaud are to be found in *La Revue de Phytopathologie*, i. No. 2, May 5, 1913.

but that the leaves are infected directly from the exterior, probably by spores which have wintered hidden in crevices of the bark &c.

Outbreaks of curl on outdoor peaches and nectarines are generally attributed to various inanimate causes, such as unsuitable or unwholesome soil, * climatic and weather conditions, † and the last-named

FIG. 44.—BRANCHES OF PEACH TREE.
The two on the left not sprayed, those on the right sprayed with Burgundy mixture.

factors are of importance from the fact that cases of leaf curl occur rarely under glass where the conditions are more or less under control; and varietal factors. In Belgium considerable attention has been

* *Gardeners' Chronicle*, May 21, 1842, p. 333.

† PIERCE, *Peach Leaf Curl, its Nature and Treatment*, Washington, 1900; G. ARNAUD in *Revue de Phyt.*; *Gardeners' Chronicle*, May 28, 1842, p. 349 &c.

given to the suitability of the soil for Peach-growing and to the selection of efficient stocks &c. *

Clearly the more suitable the conditions under which Peach cultivation is carried out the less risk there will be of disease, but when disease does appear it is not always easy to determine exactly what conditions are wrong, and until the cause is ascertained it becomes imperative to find some remedial measure to prevent the disfigurement and fall of the leaves and failure of the fruit.

It was decided to attempt to bring the *Exoascus* curl under control at Wisley and to try in turn every method that held out any promise of success, and at first to concentrate on the idea of a simple fungicidal wash. Of the mixtures possessing undoubted fungicidal properties, and at the same time efficient and inexpensive, Burgundy mixture was chosen for a test upon the Wisley trees.

Sulphate of copper is known to be a deadly poison to plant life, and plants vary considerably in their reaction to it. The object of Bordeaux and Burgundy mixtures is to obtain copper in an insoluble and non-poisonous form, and to deposit a film of this copper on the whole surface of the plant. According to various authorities, and more recently BARKER and GIMINGHAM, this insoluble copper is then acted upon by excretions from the germinating fungi, which change infinitesimal quantities of the insoluble copper again into soluble copper sulphate, and the latter acts as a poison to the fungus. The fungus, as it were, prepares its own death potion. The quantities of copper sulphate liberated are so small that, if the ingredients of the mixture are present in suitable proportions and in a suitable state of dilution, no harm is done to the plant.

Clearly the secret of the successful use of Burgundy depends paramountly upon covering the surface of the twig or leaf as uniformly as possible with a fine film of insoluble copper. This object can be attained to a great extent by the proper mixing of the Burgundy mixture itself. The mixture consists of two simple and inexpensive ingredients—copper sulphate (98 per cent. purity) and carbonate of soda. Solutions of these salts are made up in separate wooden vessels. If the salts are ground to a fine powder they will dissolve easily, but if hot or warm water be used the solutions must be allowed to get *thoroughly cold* before being mixed. The two solutions are then mixed together when as cold as possible, and there is obtained a gelatinous precipitate of copper carbonate (insoluble) suspended in an extremely dilute solution of sodium sulphate, which is itself harmless to the plant and can be removed if necessary. This gelatinous precipitate appears only when the salts are mixed cold; when warm, the precipitate is of a different character and much less efficient. The gelatinous character of the precipitate gives it its adhesive power. The power of adhesion can be still more increased by the use of a little milk, and experiments in progress at Wisley foreshadow still greater improvements in the preparation and efficacy of Burgundy mixture.

* *Gardeners' Chronicle*, December 8, 1894, p. 691.

Both ordinary Burgundy and Wisley Lacto-Burgundy were used, the mixtures having the following compositions :—

Burgundy mixture	Copper sulphate	$9\frac{3}{4}$ oz.
	Sodium carbonate	11 oz.
	Water	3 gallons.
Wisley Lacto-Burgundy	Copper sulphate	$9\frac{3}{4}$ oz.
	Sodium carbonate	11 oz.
	Milk	$\frac{3}{4}$ pint.
	Water	3 gallons.

Prior to the spraying, special attention was given to diseased twigs in pruning with a view to reducing the amount of disease. The prunings from ten trees included 220 weak and useless growths, 223 dead ends, and 48 diseased shoots ; thus over 250 shoots removed were probably affected with *Exoascus*.

The trees, which included both nectarines and peaches, were sprayed on February 20, before the bursting of the buds. Four trees only ('Pineapple,' 'Hale's Early,' 'Humboldt' and 'Darwin') were sprayed a second time (March 5) to ensure that some trees were thoroughly covered. One half of a tree of each of the varieties 'Elruge' and 'Pineapple' was left unsprayed as a control.

The first signs of leaf curl were detected on April 23. By May 4 the symptoms had become pronounced, *but only on the unsprayed halves of the varieties 'Elruge' and 'Pineapple.'* On May 7 the effect was remarkable ; on eight of the ten sprayed trees and the sprayed halves of the other two it was difficult to find curled leaves, whilst on the unsprayed halves, especially in the case of 'Elruge,' there were nearly as many curled as uncurled leaves. On May 11 the average number of leaves on each tree was estimated to be about 1500. On this date the number of curled leaves counted *in situ* was as follows :—

Variety.	Mixture.	No. of curled leaves.
Variety unknown	Burgundy	16
'Elruge' (sprayed half) . .	,,	0
,, (unsprayed half) . .	none	230
'Barrington'	Burgundy	6
'Royal George'	,,	0
'Lord Napier'	,,	7
'Pineapple' (sprayed half) . .	Wisley Lacto-Burgundy	0
,, (unsprayed half) .	none	44
'Hale's Early'	Wisley Lacto-Burgundy	0
'Humboldt'	,, ,,	0
'Bellegarde'	Burgundy	2
'Darwin'	Wisley Lacto-Burgundy	18

On 'Darwin' the 18 leaves occurred on four diseased twigs.

The accompanying sketch (fig. 44) was made in May direct from the tree 'Elruge' at the boundary between the sprayed and unsprayed halves, and shows, on the right, two sprayed twigs with no curled leaves ; on the left, two unsprayed twigs, with a number of

curled leaves each. The representation is correct, except that the axis of each of the curled twigs is shortened in order to admit the inclusion of the four twigs in one figure.

In California, where peaches are grown in practically all parts below 4000 feet, and especially in the foothills of the Sierras and the broad valleys of the Sacramento and San Joaquin, great faith is placed in Bordeaux mixture, which is stated to afford complete control either when applied just when the buds begin to appear or when the trees have been sprayed with a very strong Bordeaux mixture in December for blight.* Bordeaux mixture has been found to be effective in New Zealand, † and testimony to its beneficial action occurs repeatedly in the reports issued by the New Zealand Department of Agriculture.

But a distinct advantage of Burgundy over Bordeaux from a fungicidal point of view in the treatment of peach curl was claimed by GEORGE QUINN in Australia. ‡ QUINN, whose experiments on an extensive scale extended over three years, tested a number of mixtures, including Burgundy, Bordeaux, lime-sulphur, Woburn Bordeaux, Bordeaux powder, copper solution, &c., and found that Burgundy mixture prepared from the raw materials excelled all. The present season's experience at Wisley supports in a remarkable manner QUINN's results.

In "Diseases of Cultivated Plants and Trees" MASSEE advises that "the only certain method of eradicating this disease is by removing all infected shoots. Spraying with Bordeaux mixture has many advocates, but the fact remains that the perennial mycelium present in the shoots produces a crop of diseased leaves each year, in spite of spraying. Spraying will undoubtedly prevent infection from spores, but if the cause of infection is removed by cutting away infected shoots no spores would be forthcoming to infect healthy shoots." At Wisley, pruning, however thoroughly performed, failed to rid us of this pest and failed even to check the amount of curl to any considerable extent; spraying, on the other hand, actually prevented the appearance of a crop of curled leaves. The mind has been too strongly intent on the infection of the leaves from mycelium in the shoot, a method regarded by ARNAUD as of comparatively small importance—an opinion supported by practical results in many countries. We are more concerned with what the fungus actually does than with what it can or may do.

Burgundy mixture should be given a fair trial in this country, since the mixture is easily prepared, the ingredients are easily obtained and easily stored—important practical advantages over Bordeaux; moreover, the mixture has little action upon the operating parts of the spraying machine, being free from gritty particles, which in the case of Bordeaux mixture exert a wearing action on the apparatus.

* C. F. COLLINS' address to the State Fruit-growers' Convention, San José, Cal., Dec. 2–4, 1913.

† W. A. BOUCHER, *N.Z. Dep. Agric., Div. Biol., Tenth Report*, 1901–2.

‡ G. QUINN, *Jour. Dep. Agr. S.A.* xviii. (Aug. 1914), pp. 32–37.

WINTER-FLOWERING SWEET PEAS AT WISLEY, 1914–15.

REPORT BY C. C. TITCHMARSH, Trials Officer.

THE forcing of Sweet Peas into flower during winter and early spring has seldom been practised with success in this country. In the United States, however, varieties such as 'Blanche Ferry' and 'Mont Blanc,' well known as rather early-flowering kinds, have for some time been flowered under glass in winter. During the last few years a number of varieties, said to be of distinct type from the summer varieties, have been grown in this manner. In order to ascertain what value such varieties possess in this country, the Council authorized a Trial of Sweet Peas for winter flowering in the winter of 1914–1915. Seed was sent from sources as widely separated as Australia, California, North Africa, and the South of France, while a number of plants were received from an English grower. The seeds of most of the varieties were sown on July 29, and at the same time those of a number of well-known 'Spencer' and 'Grandiflora' varieties were sown for comparison. A number of varieties, received late, were not sown till September 8. The plants resulting from these were less vigorous than those produced by the earlier sowing. In a few cases more, and in some cases less, than ten seeds of a variety were received. As the germination was not good it was possible in but few cases to raise more than five or six plants of a variety. After germination the seedlings were grown in five-inch pots in a cold frame. On November 5 the plants were potted into twelve-inch pots and were placed on the stage of a cold greenhouse. It was then apparent that the collection contained representatives of at least two distinct types: in one the plants formed unbranched stems with long internodes, the others branched profusely with thicker, shorter internodes, and broader, darker leaves.

During November and December the plants made little progress and called for the exercise of great care in watering. It is probable that the low intensity of light during these months was responsible for the check.

It was not until the opening weeks of the New Year that growth recommenced; the plants of the first-mentioned type grew rapidly and began to form flower-buds, usually from the sixteenth to the twentieth node above the soil level. As the plants were considered to be too weak and spindly to bear flowers, the buds were removed, as soon as they appeared, until the middle of February. The first flower opened on February 27, and was rapidly followed by others until a fortnight later all the plants of the single-stemmed type were in bloom. They reached a height of 2½ to 4½ feet. The removal of the earlier flower-buds made it impossible to ascertain the comparative earliness of

individual varieties. Duplicate pots of the same variety varied considerably in the dates of the production of the first flower-buds.

By the middle of April, when the bulk of the collection was destroyed, the summer-flowering varieties, which had, throughout the trial, received the same treatment as the winter-flowering ones, had formed tall, bushy plants, but none had produced a flower-bud. (Fig. 45.)

The winter-flowering varieties retained continued flowering for many weeks; the summer-flowering ones commenced flowering May 8.

* * * * * * * *

There are at least four separate races of winter-flowering Sweet Peas now in cultivation. There seems a disposition to claim the American variety 'Blanche Ferry' as the ancestor of winter-flowering varieties, but it seems clear that these races have originated in several localities and from distinct ancestors.

The first-recorded plant of the winter-flowering type appeared in 1892, in the greenhouse of Ant. C. Zvolanek, New Jersey, U.S.A., as a sport from 'Lottie Eckford.' 'Lottie Eckford' was introduced by Eckford in 1890, a year after the introduction of 'Blanche Ferry.' The original sport was not put into commerce by Zvolanek. His first-distributed variety was 'Zvolanek's Christmas'—the offspring of a cross between this sport and 'Blanche Ferry.'

A second race—the 'Telémly'—originated in Algeria, as a sport from 'Blanche Ferry.' Its introducer, the Rev. E. Arkwright, gives an account of its origin in the *Sweet Pea Annual* for 1907.

In the same number of that journal, C. Engelmann relates the history of another race derived from a winter-flowering form which appeared among some plants of 'Captain of the Blues,' an Eckford variety introduced in the same year as 'Blanche Ferry.'

At Wisley no differences were observed between these three races.

The fourth race, comprising varieties from Messrs. Yates, of Sydney, was markedly more robust in habit—a condition which became increasingly apparent as the flowering season advanced. Mr. A. Yates, in a communication to the *Gardeners' Chronicle* (vol. 54, 1913, p. 113) and again in the *Sweet Pea Annual* of 1914, says: "About five years ago, in the garden of a Mr. James Young, of Sydney, there appeared among a batch of 'Novelty'* Spencer Sweet Peas one plant of true 'Spencer' type quite distinct from all the others. It was different in its vigorous habit and upright growth, earliness, and colour; in fact, it was in full bloom when the others were only a few inches high, and had gone to seed before the normal type had begun to show flower-buds."

It seems, therefore, that the variety 'Blanche Ferry' has given rise to only one of these races, the other three having been derived from distinct mutations in widely different localities.

This view is supported by the fact that a plant of the winter-

* 'New' Spencer in *Sweet Pea Annual.*

A B

FIG. 45.—SWEET PEAS.

A, WINTER-FLOWERING TYPE; B, SUMMER-FLOWERING TYPE.

[To face p. 116.

flowering type has arisen this spring in a batch of a pure-bred summer-flowering variety in the greenhouses of a well-known firm.

Further experiments with these plants will be carried out at Wisley.

The Sub-Committee which inspected the Trial on March 19 expressed its appreciation of the excellent cultivation of the plants in the Trial, which was in the hands of Mr. J. Wilson, Garden Foreman.

The following varieties were of the summer-flowering type, grown for comparison with the alleged winter-flowering stocks: —Nos. 1–3, 5–9, 11, 12, 18, 19, 26–31, 37–47. These numbers are omitted from the following list.

All the varieties in the following list up to and including No. 36 were from Mr. C. Engelmann, of Saffron Walden; Nos. 48–66 from Rev. E. Arkwright, of Algiers; Nos. 67–138 from Mr. A. C. Zvolanek, of California; Nos. 139–143 from Messrs. Yates, of Sydney, Australia; Nos. 144–150 from Mr. F. Paul, of Botley, Hants.

* List of Sweet Peas.—Wisley.

4.‡‖Cerise, waved, 17.
10.‖ Light Pink, 8.
13. Maroon, W. 6.
14. Maroon, W. 9.
15. Maroon, very dark, 26.
16. Pale Mauve, W. 27.
17.‡ Mauve, 10.
21.‡ Pale pink waved, good, 7.
22.‖ Pinky Mauve, 41.
23.‖ Pinky Mauve, W. 5.
24. Purply Blue, W. 4.
25.‡ Purply Pink, waved, 2.
32. Waved Pink, 1.
33.‡ Waved Pink, 3.
34.‡ Waved Pink, W. x.
35.‡ White, W.
36.‖ White, x.
48. Blue and Lavender.
49.‡ Blue and Red.
50. Claret.
51.‖¶Cream and Pink.
52.‖¶Grey.
53.‖ Lavender.
54.‖ Maroon.
55.‖ Mauve.
56.‖ Orange Scarlet.
57.‖ Purple and Maroon.
58. Red (self).
59.‖¶Red (2 shades).
60. Ruby.
61.‖¶Violet.
62.‡ White.
63. Apple Blossom.
64.‖ Pale Pink.
65.‖ Blush.
66.‖¶Cerise.
67. Christmas Pink Orchid.
68. Californian.
69. Union Jack.
70. Mrs. R. Ward.
71. Mrs. Elu Wright.
72. Red Head.
73.‖ Father Reilly.
74. Curliana.
75. Lavender Orchid.
76. Baby Orchid.
77.† Belgier.
78.‖ Bicolor Orchid.

* All trials in the Wisley Garden are carried out under number only until judging is completed. The number prefixed to the name of the variety in the Report corresponds with that by which alone the variety was known until judgment had been given. Fellows visiting the Garden and noticing any plant under a number can easily ascertain its name later by reference to the Report in the Journal.

79.|| Black Lady.
80. Blue Bird.
81. Blue Jay.
82.† Blush Girl.
83.† Bohemian Girl.
84. Bridal Veil.
85. Miss Fl. Roland.
86. Helen Keller.
87. Helen Gould Orchid.
88. Kate Korych.
89.|| King Blue.
90. King of England.
91. Lavender Nora.
92. Le Marquis.
93.† Lilac Gem.
94.|| Miss Lulu.
95. Montenegrin.
96.† Moravia.
97.|| Moravia.
98. Miss Flora Fabing.
99. Morning Star.
100. Mr. John Barker.
101. Mrs. A. A. Skach.
102. Mrs. Dolansky Orchid.
103.|| Mrs. H. Gross.
104.¶ Mrs. G. Calvert.
105.|| Mrs. Jos. Manda.
106. Mrs. J. M. Barker.
107.|| Mrs. M. Spanolin.
108. Mrs. Smalley Orchid.
109. Mrs. T. Roland.
110.|| Niger Orchid.
111. Norma.
112. Orange Bird.
113. Orange Nora.
114.||¶Orange Orchid.
115. Orange Orchid.
116. Orchid Beauty.
117. Orela.
118.|| Othello Orchid.
119.|| Pacific.
120.|| Polar Bear.
121. Polar Light.
122. Pres. Woodrow Wilson.
123. Princess.
124.|| Red Orchid.
125.|| Santa Ynes.
126. Serbian Prince.
127. Souvenir of Mrs. Wilson.
128.|| Sweet Marie.
129. The Countess.
130. The Czar.
131.|| Venus.
132.|| Vermilion.
133. Vive la France.
134.|| White Kozak.
135. White Orchid.
136. White Nora.
137. Capitan Orchid.
138.† Christmas Nubian.
139. Yarrawa Spencer.
140. Concord Hybrids.
141. Concord Meteor.
142. Concord Blush.
143.||¶Concord Purple.
144.|| Maroon.
145. Heliotrope Pink.
146.|| Rose.
147. Pink.
148.|| Lilac Pink.
149.||¶Purple.
150. ¶Mauve.

None of those stocks which proved untrue are described below.

† These stocks failed.
‡ These stocks contained both summer and winter-flowering types.
|| These were untrue for colour.
¶ These were untrue for form of flower.

XXX.—Highly Commended.

The symbols in parentheses after the colour are the index figures to Ridgway's "Colour Standards and Colour Nomenclature," from which the colours are taken.

I. Flowers White.

84. Bridal Veil.—Usually 2-flowered; standard waved; wings large, spreading, waved; leaves smaller and darker than in most, tendrils foliose.

136. White Nora.—Only one plant was raised. It produced large waved flowers of excellent form.

135. White Orchid.—Flowers borne in pairs, small; standard waved.

II. Flowers Cream.

69. Union Jack.—Usually 2-flowered; standard large waved; wings little waved, spreading.

III. Flowers Blush.

63. Apple Blossom.—Flowers in pairs, facing in the same direction, large; standard waved; wings very large, much waved. Flowered later than most of the winter-flowering varieties.

76. Baby Orchid.—Usually 2-flowered, medium size; standard waved; wings large, erect.

109. Mrs. T. Roland.—Occasionally 3-flowered, large; standard waved; wings large, spreading, much waved; leaf axils and tendrils red.

111. Norma.—Usually 2-flowered, medium size; standard flat; wings spreading, slightly hooded.

129. The Countess.—Rarely more than 1-flowered, small; standard waved; wings pointed, spreading.

IV. Flowers Pink on a White Ground.

145. Heliotrope Pink.—Usually 2-flowered, small; standards waved, paler in the centre; wings much waved.

85. Miss Fl. Roland.—Flowers in pairs, small waved, opening rose pink, but becoming flushed with lilac with age.

101. Mrs. A. A. Skach.—Flowers as in No. 145, but larger and of poor substance.

106. Mrs. J. M. Barker.—Usually 2-flowered, flowers facing in opposite directions, colour deeper at the margins of the petals; standard waved, notched at one side; wings waved.

70. Mrs. R. Ward.—**XXX** March 19, 1915. Usually 3-flowered, set close together, large, very well shaped; standard waved; wings half open, waved; leaves darker than in most.

100. Mr. John Barker.—Usually 2-flowered, large; standard waved; wings large, spreading.

99. Morning Star.—Identical with 145 (above).

147. Pink.—Flowers occasionally in threes, medium to small; standard waved; wings waved, large, spreading.

121. Polar Light.—A winter-flowering counterpart of 'Countess Spencer,' rarely 2-flowered.

127. Souvenir of Mrs. Wilson.—Flowers in pairs, set at right angles, large, becoming paler with age; standard waved; wings large, spreading.

130. The Czar.—Flowers borne singly, large, of poor substance; standard waved; wings large, spreading, waved.

V. Flowers Pink on a Slight Cream Ground.

142. Concord Blush.—Often 3-flowered, medium size, becoming paler with age until the wings become white; standard waved; wings large.

98. Miss Flora Fabing.—Flowers of the form and colour of 'Yarrawa Spencer,' but much smaller.

108. Mrs. Smalley.—Flowers in pairs, medium size; standard waved; wings large, spreading.

32. Waved Pink.—A stock of 'Yarrawa Spencer,' *q.v.*

139. Yarrawa Spencer. **XXX** March 19, 1915.—Flowers in threes, facing in the same direction, large, of excellent shape and colour; standard waved; wings half open, waved. The most vigorous winter-flowering variety in the Trial.

VI. Flowers Rose.

88. Kate Korych.—Flowers in pairs, facing in the same direction, of good substance, large; standard waved, notched at sides; wings large, lightly waved.

112. Orange Bird.—Flowers in pairs, small; standard hooded; wings much hooded, pointed. The flowers are so hooded as to give them a shrivelled appearance.

116. Orchid Beauty.—Flowers in pairs, distant, facing in opposite directions; standard waved, not pigmented at the top; wings large, lightly waved.

122. President Woodrow Wilson.—Flowers in pairs, facing in the same direction, of poor substance, light mallow purple (67 d), tinged with rose red (71) at the margins of the petals; standard waved, notched at the sides; wings large, spreading.

123. Princess.—Flowers in pairs, facing in opposite directions, rather thin; standard waved, rounded; wings folding around the keel.

126. Serbian Prince.—A variety differing from 'Kate Korych' (above) only in the small size of the standard as compared with the wings.

VII. Flowers Deep Rose.

115. Orange Orchid.—Flowers in pairs, wide apart, medium size; standard waved, deeply notched at apex; wings paler, spreading.

FIG. 46.—CAMPANULA 'WHITE STAR'

[To face p. 120.

FIG. 47.—CAMPANULA TOMMASINIANA.

FIG. 18.—CAMPANULA 'NORMAN GROVE'

VIII. Flowers Crimson.

90. King of England.—Flowers in pairs, close together; standard waved; wings large, spreading.

58. Red (self).—Identical with 'King of England' (above).

133. Vive la France.—A variety differing from 'King of England' only in the paler colour of its standard.

72. Red Head.—Flowers in pairs, facing in opposite directions, rose red, paler on the wings; standard waved; wings large, spreading, with a central fold.

IX. Flowers Lavender.

16. Pale Mauve.—Flowers in pairs, set close together, medium size; standard flat; wings upright, somewhat hooded.

X. Flowers Lilac.

87. Helen Gould.—Flowers in pairs, distant, medium size, good form; standard waved; wings paler, much waved.

91. Lavender Nora.—Flowers borne singly, medium size, slight pinkish lilac (65″ f), flush; standard hooded; wings much hooded, pointed.

75. Lavender Orchid.—Flowers in pairs, large; standard flat, notched at apex; wings erect, hooded, very pale.

XI. Flowers Pale Blue.

81. Blue Jay.—Flowers medium size; standard flat, notched, not pigmented at apex; wings pointed, slightly hooded.

68. Californian.—Flowers in pairs, distant; peduncle short, weak; standard waved; wings spreading, slightly waved.

71. Mrs. Elu Wright.—Flowers borne singly, medium size, opening mallow purple (67 b), passing to lavender violet (61′ b) with age; standard waved; wings erect, half open.

117. Orcla.—Flowers in pairs, large; standard waved, light purple (65 a), paling with age to the same colour as the wings; wings light lavender violet (61 d).

XII. Flowers Deep Blue.

92. Le Marquis.—Flowers in pairs, medium size; standard flat; wings large, spreading, rounded, distinctly bluer than the standard.

XIII. Flowers Purplish-blue.

80. Blue Bird.—Flowers in pairs, distant, medium size, rose purple (67′ d), becoming a light shade of Bradley's violet (59′) as the flower ages; standard flat; wings upright, hooded, with a characteristic fold in the middle.

24. Purply Blue.—Flowers in pairs, facing in the same direction, large, purple (65), becoming lavender violet (61′ b) as the flower ages, all intermediate shades being found on the same plant; standard hooded; wings hooded.

XIV. Flowers Deep Purple.

50. Claret.—Flowers singly or in pairs, then distant; standard flat, dark raisin purple (65 b); wings spreading, somewhat more blue than standard.

13. Maroon.—Flowers in pairs, deep Rood's violet (65′ i), not coloured at apex; standard waved; wings large, waved, paler than standard; leaf axils blotched red, tendrils red.

15. Maroon, very dark.—Flowers rarely in threes, close together; standard hooded, Cotinga purple (63 k) on the back, redder in front; wings hooded, spreading, dark violet (59 k), distinctly veined

95. Montenegrin.—Flowers borne singly, small, light aster purple (67 h), bluer towards centre; standard waved; wings spreading, speckled white.

102. Mrs. Dolansky.—Flowers smaller, but not otherwise different from No. 95 (above).

XV. Flowers Bicolor.

137. Capitan Orchid.—Only one plant of this variety was raised. It bore waved flowers of moderate size; standard deep rose pink (71 c); wings white or slight blush.

67. Christmas Pink.—Flowers in pairs; standard flat, notched at apex, rose red (71) to rose (71b); wings half open, white or faintly blush.

141. Concord Meteor.—Flowers singly or in pairs, medium size; standard flat, notched at apex, deep rose red (71); wings spreading, mallow purple (67 b), deeper at margins.

74. Curliana.—Flowers borne singly; standard flat, light amaranth pink (69 b); wings waved, half enclosing keel, white.

14. Maroon.—Flowers in pairs, facing in opposite directions; standard hooded, notched at apex, dahlia purple (67 k); wings partly open, light hyacinth violet (61 h).

113. Orange Nora.—Flowers borne singly, medium size; standard hooded, notched at apex, deep rose pink (71 d); wings blush or white.

60. Ruby.—Flowers rarely in pairs; standard flat, notched at apex, deep rose (71 a); wings half open, pointed, mallow purple (67 c).

XVI. Flowers Flaked.

86. Helen Keller.—Flowers in pairs, facing in opposite directions, large, white flaked rose (71 b), especially on the waved standard; wings large, spreading.

XVII. "Mixed Stocks."

48. Blue and Lavender.—This stock contained plants bearing flowers with waved and flat standards of various shades of blue and lavender. It included what was probably the finest flower in the Trial—a waved lavender of good form borne in threes.

140. Concord Hybrids.—Flowers of varying shades of blue and red; standards flat.

THE ORIGIN OF CAMPANULA 'NORMAN GROVE.'

By T. B. Grove, F.R.H.S.

About the middle of July 1911 I chose a plant of *Campanula* 'White Star' (fig. 46), which was just showing flower in a 60 pot, and dropped it into the bottom of a larger one, filling round the inside pot with soil so as to retain moisture.

I took off all but three flowers, which I allowed to grow, and as soon as the unopened flowers were large enough I carefully cut them open and took away the anthers. I then covered them in completely with tissue paper and waited until the flowers expanded, which was about July 20. I fertilized with pollen from *C. Tommasiniana* (fig. 47) on July 21, 22, and 24, as the flowers were ready. On August 26 I found that *only one pod* had any trace of seed in it, and I sowed a small portion of it on that day. Three seedlings appeared in the pot during September, which I named Z.1, 2, and 3 respectively. Z.1 is the 'Norman Grove' in question (fig. 48); Z.2 is a rather paler blue form, very similar to Z.1, but rather larger than that variety, and throws a more bunched spike (sometimes 5 and 6 terminal). Z.3 did not survive the winter of 1911–12. On March 3, 1912, I sowed the remainder of the pod of seed and 16 more seedlings germinated, out of which I have managed to save 10 up to autumn 1914.

All that have flowered are blue, although differing in depth of colour; some seem to be medium blue, with streaks of darker blue running down the blooms; one has produced a very small flower, not much larger than *Wahlenbergia hederacea*, but flat in proportion to its length, and with the points of petals rather reflexed. Another is very compact and has a pale blue flower, and with flower and colour of foliage reminds one of *C. haylodgensis*. Several show signs of yellow variegation in the foliage. 'Norman Grove' is uniform medium blue; and of compact growth. The foliage shows a decided red tinge in its very earliest stages; as it develops it becomes green and produces small roundish leaves and growths like a miniature 'White Star.'

The growth of the whole of the seedlings resembles a miniature form of 'White Star,' some with a red flush, some perfectly green throughout; one or two have shown signs of a tendency to produce lanceolate foliage (like the male parent) upon the terminals of the autumn shoots.

I have also seedlings of Z.1 and Z.2 which have resulted from re-crossing with pollen from 'White Star,' and also a nice healthy lot of seedlings of Z.1, fertilized with its own pollen, and which show signs of producing decided variations of growth.

NOTE ON FURTHER TRIALS OF EXPLOSIVES IN THE GARDEN.

By HERBERT E. DURHAM, SC.D., M.B., B.C., F.R.C.S.

IN this JOURNAL last year (vol. xl. p. 16) the intention was announced that the effect of exploding ground in existing plantations would be tried. This intention was carried out upon half of a long herbaceous border and upon halves of two old asparagus beds.

Herbaceous Border.—The border was about two yards wide and twenty-two yards long, and contained an ordinary mixture of plants such as Phloxes, Madonna lilies, Asters, *Lychnis chalcedonica*, and annuals. For some reason the western half had never been so luxuriant as the other half, and was therefore chosen for the trial. Three two-ounce charges of cheddite, placed 3½ feet deep, were exploded in the western 11 yards; no other activities were displayed beyond weeding and surface stirring. On July 25 a number of friends were informed that half the bed, east or west of the middle mark, had been exploded, and were requested to record their opinion as to which appeared to be the better grown. Curiously enough, eight recorded in favour of one half, and likewise eight in favour of the other, so that evidently there could not have been much difference at the time, when indeed things were rather over. In respect of the previous poorness of the exploded side, the verdict was in favour of the treatment, as was that of two experts who had inspected the bed at earlier dates. The most marked effect was the height to which the *Lychnis chalcedonica* grew on the exploded side, nearly double that of the other; and the Madonna lilies also looked more prosperous. But it is difficult to make a very close discrimination in cases like this, where the scales and weights cannot be brought into use. Judging by the effect on asparagus, I am inclined to think that one-ounce charges would have been better. The time needed for thus "cultivating the soil" was but a mere fraction of that which would have been needed to remove all the plants, dig the soil, and replace the plants; in fact, in half an hour or less the whole work was done.

Asparagus.—Of two asparagus beds of many years' standing, the northern half of one was given three *one*-ounce charges, and the southern half of the other had three *two*-ounce charges, in both cases at a depth of 3½ feet, and with the necessary precaution against cavitation. At the time, the two-ounce dose looked as if it were rather drastic. The portion treated with one-ounce cartridges soon went ahead, and whilst one shoot reached very nearly the height of 9 feet, several were 8½ and

FIG. 4[illegible].—OLD ASPARAGUS BED. PART NOT EXPLODED. HEIGHT STANDARD 6 FT.

The piece in hand was the tallest in the plot.

[To face 13[illegible].

FIG. 50.—OLD ASPARAGUS BED. PART EXPLODED. HEIGHT STANDARD 6 FT.

[The piece in hand was of the average height.]

7 feet, whilst on the unexploded part of the same bed no piece reached up to 6 feet. A few stragglers on the two-ounce patch reached the latter height, but the growth was irregular. The two photographs (figs. 49, 50) show the difference in growth on the bed which was treated with one-ounce charges ; the black line on the height gauge is at 6 feet from the ground. The increase of growth is in agreement with the effect I have already recorded (*loc. cit.* p. 16) in regard to seedling asparagus. A further fact also brings one certainly to the conclusion that the exploding was the cause of the increased growth. As the summer waned the shoots on the unexploded areas became sere and yellow, and a time arrived when all the plants on unexploded ground were yellow except one only, an outlier. On the two-ounce patch four or five of the plants were still green, whilst on the one-ounce part not a single plant showed any yellowness ; later the last trace of green was to be seen on this part.

The seedlings which were referred to in my previous paper naturally were much more luxuriant last summer where the soil had been exploded than those which were planted on unexploded soil, as they had such a good start in life. One can but conclude that, in this soil, explosives materially assist the growth of asparagus.

Potatos.—My potatos last year were the subject of rather complex conditions, and those under experiment were all of one variety, viz 'Dobbie's Provost.' Unfortunately it did not prove very disease resistant, and the *Phytophthora* seemed to be making so much headway that in August (10-15) the haulm was cut back to save the crop ; hence the weights are much smaller than they would have been otherwise ; happily the store (February) seems nearly free from diseased tubers. The seed tubers were graded into three sizes, "large," "medium," and "small." Half of each row was on ground that had been dressed with fine-broken wood charcoal, the object in view being to see whether this material, with its considerable power of absorbing oxygen, would have a favourable effect on our clayey soil. In order to minimize the effect of potash in the charcoal, two top-dressings of sulphate of potash and of ammonia were given at planting and on appearance. It may be noted also that the charcoal had a distinct odour of creosote. The accompanying tabulated statement gives the details of the different groups, the figures being the average weight of crop per plant in pounds and decimals. The exploded part was treated with two-ounce charges 6 feet apart, *in quincunx*, at a depth of fully 3½ feet. It will be noted that the figures for the small and medium-sized seed on the unexploded ground are somewhat discrepant ; this may be due to the site of the previous season's celery trench, which was wide enough for three rows of plants. Further, the non-charcoaled portion of the exploded site is somewhat shaded by a hornbeam hedge on its south, and here the greater number of diseased tubers were found. The whole area gave identical average weights for the plants (2·16lb.), whether on exploded or non-exploded ground. Taking the crop from large seed, the preponderance is 46 per cent. in favour of exploding; that from

large and medium seed together is also in favour of exploding (13 per cent.). The crop on the whole charcoaled area was 25 per cent. greater than that on the non-charcoaled area, though the figures in the different parts are somewhat discrepant.

AVERAGE WEIGHTS OF TUBERS PER PLANT (LBS.).

Size of seed tuber.	Number of rows.	Charcoal.	No charcoal.	Total.	
Large . . .	4	2·009	1·415	1·712	NOT EXPLODED
Medium . . .	5	2·607	1·96	2·28	NOT EXPLODED
Small . . .	4	1·93	1·92	1·925	NOT EXPLODED
Large . . .	4	3·15	1·88	2·51	EXPLODED
Medium . . .	5	2·15	1·88	2·01	EXPLODED
Small . . .	3	1·91	1·72	1·81	EXPLODED

'Dobbie's Provost' does not seem to be so favourably affected by the explosive treatment as was the case with 'Crimson Beauty' in the previous year. It will be interesting to see whether the exploding two years ago will affect the crop which is soon to be planted on the same plot of land.

Soil Treatment for Strawberries.—Soil treatment by means of injections is perhaps a sufficiently correlated subject to allow me to record here a striking result obtained last summer. A three-year-old strip of strawberry plants ('La Productive'), two deep, was divided into three lengths of about five yards each. At the end of May injections were given by means of the Pal injector to the outer thirds, the middle third being left untreated for control. The material used was a mixture of about equal parts of carbon disulphide and tetrachloride, to which was added a small proportion of crude Dippel oil. An injection was made between each pair of plants, with one stroke of the piston on the "single dose" plot, and two strokes on the "double dose" plot. The weather was very favourable for ripening; both quality and flavour were consequently well developed. From August 23 onward most of the pickings were counted; only well-developed fruits were recorded, and a foot breadth at the adjoining limits of the plots left out. In general the countings agreed with the final sum in that the "double dose" plot led, the "single dose" plot came a good second, and the "control" plot was left far behind. The eventual sum of fruits picked was as follows:—

"Control" plot, 292.
"Single dose" plot, 452.
"Double dose" plot, 472.

It will be seen that the injected plots were practically the same in yield, and that the double injection was not needed. Except for the fact of the injections there is no obvious cause why the yield should have varied in different portions of the strip, the exposure, soil, and age of

plants having been identical. I think, therefore, that we may safely conclude that the injections were the stimulating cause.

POSTSCRIPT.

Since writing the above, the paper "On the Use of Charcoal as Medium for Plant Growth" has appeared (R.H.S. JOURNAL, xl. p. 473, April 1915): therein the possibility of some action being due to oxygen absorption on the one hand and to the presence of creosote-like bodies and potash does not appear to be discussed. The action is probably complex, and probably some further investigation would be of interest if not of importance. As a menstruum for applying some of the less volatile soil fumigants it might have some value. All my onion crop was charcoaled last year, but unfortunately no control patch was left, so that whether the excellent way in which the onions have kept in storage may have been due to this cause is uncertain.

A NOTE ON STORING APPLES.

Mr. G. O. Nicholson, of Market Harborough, sends us the following interesting note on apple storage :—

Very few apple-growers seem to adopt the method I have found most effective for keeping eating apples (more particularly) in good sound condition until March or April. It is as follows :—

Obtain a supply of peat moss litter and break it up as finely as possible, and if dry sprinkle it with water until the whole is uniformly moist, but not wet.

Use boxes of the depth of about 12 to 15 inches, place a thin layer of peat moss at the bottom, and then add a course of apples, selecting only well-ripened and absolutely sound samples. Place the apples so that they do not quite touch each other, and then add a layer of peat moss to cover the apples, slightly pressing it down so as to leave no hollow spaces.

Alternate layers of apples and peat moss follow, until the box is filled, and the boxes are then placed in an ordinary frost-proof cool cellar.

The peat moss seems to act as an antiseptic, checking decay, or if decay takes place in any one apple it does not easily spread.

I have used this method with 'Worcester Pearmain,' 'Ribston Pippin,' 'Cox's Orange Pippin,' 'King of the Pippins,' 'Blenheim Orange,' 'Lord Burghley,' and 'Bramley's Seedling,' and can confidently recommend it as simple, economical, and effective. A real good late apple can be kept until May if required.

BOOK REVIEWS.

"Trees: A Woodland Notebook containing observations on certain British and Exotic Trees." By the Rt. Hon. Sir Herbert Maxwell, Bt., F.R.S., LL.D. (Glasgow), D.C.L. (Durham). 4to. 235 pp.; illustrated. (MacLehose, Glasgow, 1915.) 21*s*. net.

So many books of a trashy description have of late appeared on the subject of trees and shrubs that it is quite refreshing to turn to this sumptuous volume, which has been written by one who has devoted a lifetime to their study and wants. There is nothing pretentious about this book on our woodland trees, but incidentally, in addition to being thoroughly practical, the keen observations of the writer, many of which have not before been recorded, render the work one of the most interesting and valuable of any that have yet appeared on the subject. And in addition to its practical side the book is most pleasantly written, the many interesting notes on trees, and dry humour of the author, which crops out where least expected, luring one on to finish off the reading of the volume at a sitting.

The book is divided into thirty-four chapters, the leading characteristics of our indigenous forest growth and exotic species of trees that are likely to succeed in this country being exhaustively dealt with. Soil, situation, rate of growth, and quality of timber all come in for a share of attention. The book is well got up in good readable type, is beautifully and copiously illustrated, and is altogether thoroughly recommendable.

"Flora of Jamaica, containing Descriptions of the Flowering Plants known from the Island." By William Fawcett, B.Sc., F.L.S., late Director of Public Gardens and Plantations, Jamaica, and Alfred Barton Rendle, M.A., D.Sc., F.L.S., Keeper of the Department of Botany, British Museum (Natural History). Vol. iii., Dicotyledons (Piperaceae to Connaraceae). With 113 text illustrations and 5 plates. 8vo., xxiv + 280 pp. (British Museum (Natural History), London, 1914.) 15*s*.

When Sir William Hooker, some sixty years ago, persuaded the British Government to have a series of Floras prepared for all parts of the Empire, A. H. R. Grisebach, a German botanist, afterwards well known as the author of "Die Vegetation der Erde," was employed to produce the "Flora of the British West Indian Islands," which appeared between 1859 and 1864. Good as Grisebach's work was, not a few plants inevitably escaped his notice; and Jamaica is fortunate in having a complete Flora, by most competent hands, now devoted

to her plants. The work is planned to occupy six volumes, of which this one—the second to appear, although the third in the final sequence—begins the treatment of Dicotyledons.

The Botanical Department of the British Museum has a traditional reputation for extreme slowness of production ; but it must be added that this has always arisen from the extreme—we had almost written excessive—care devoted to its publications. Mr. Fawcett's official residence in the island as Government botanist for twenty years has fitted him in an exceptional degree for the task to which he has devoted unremitting labour since his return to England. The history of his work is in this in marked contrast to that of his illustrious predecessor Sir Hans Sloane, who was only a few months in the island, although his "Natural History of Jamaica" was not completed for more than a quarter of a century. Mr. Fawcett's work has been done mainly in the Botanical Department of the British Museum, with Sloane's collections literally at his elbow ; and he has been fortunate in securing the collaboration of Dr. Rendle, the Keeper of the Department, the carefulness of whose work is known to every botanist.

In beginning with Monocotyledons, and in the sequence of Families adopted—this volume starting with Piperaceae—the work shows itself to be on thoroughly modern lines. Distinctive characters are wisely italicized in the conspectus of Families ; a key to the Families is added ; and all the descriptions, which include keys to the species, are in English. A somewhat unusual feature in Floras of this class is the introduction of a figure with analytical details of at least one species in every genus ; and as these and the five plates are from the skilful pencil of Mr. Highley, they add greatly to the value of the work.

Among the more interesting points in the present instalment of the Flora are the thirty-eight species of *Peperomia* and forty-two of *Pilea* and the large representation of the parasitic Loranthaceae, of which there are twenty-one species in six genera. Though numerous changes in nomenclature have been necessary, and new combinations, such as *Dendrophthora opuntioides* for *Viscum opuntioides* L., which combines the male *D. gracilis* Eichl. with the female *D. Danceri* Kr. & Urb., are also many, the authors have already published most of their new species in the "Journal of Botany" ; but one, *Alternanthera parvifolia*, is figured and described here (p. 139).

We hope that before their work is brought to its close the authors will give an account of previous workers, and especially of such hitherto unpublished materials as the collection made by Dr. Arthur Broughton and the drawings of the Rev. John Lindsay, both belonging to the eighteenth century, to which reference is made in their preface.

"A Pocket Synopsis of the Families of British Flowering Plants (based upon the System of Engler)." By W. B. Grove, M.A., Lecturer in Botany at the Birmingham Municipal Technical School. Sm. 8vo. pp. vi + 49. (Longmans, London, 1915.) 1*s*. net.

The English systematic botanist has always carried conservative

caution to the verge of obscurantism. Those trained in Ray's attempt at a natural arrangement surrendered most unwillingly to the revolutionary artificial grouping of Linnaeus; and half a century later the followers of the Swedish botanists were even more determined in their resistance to the Natural System of the Jussieus and De Candolle. Now, after another half-century, we are showing almost equal reluctance to the adoption of changes "made in Germany." It has long been admitted that the division of Gymnosperms from Angiosperms is far more fundamental than that between Monocotyledons and Dicotyledons; and yet we still too often see the Coniferae sandwiched between Amentaceae and Typhaceae. It has also long been accepted as a pious opinion that the Incompletae are a heterogeneous assemblage which ought to be distributed to the neighbourhoods of groups of chlamydeous plants to which they show affinities in some cases obvious. Here, however, comes the difficulty. We are not prepared to acknowledge that Dr. Engler, or anyone else, has solved all the problems as to the affinities of all the Families; and some are, therefore, unwilling to adopt his system, in spite of its close approximation to the desired accurate representation of these affinities. The scheme was first put forward in 1892, a year before the completion of that of Bentham and Hooker; but it has undergone many improvements since then, down to the seventh (1912) edition of the "Syllabus der Pflanzenfamilien." In 1897 Dr. J. C. Willis gave a full synopsis of the system, with the characters of the Orders (then called Cohorts), in his "Manual of Flowering Plants," and ten years later Messrs. Britten and Rendle thought it well to append to their "List of British Seed-Plants and Ferns," though it is arranged on the old system, a "Sequence of Orders (Families) according to recent views of affinity," which is in the main Engler's. Lastly, only a few months back, the Cambridge University Press issued an absurdly high-priced little book—four shillings for 139 pages—by Dr. Humphrey G. Carter—giving not only the Families, but also the characters of the genera of British plants arranged on Engler's system. This has well-nigh rendered Mr. Grove's somewhat cheaper book—one shilling for 55 pages—unnecessary; but the latter is a convenient pocket-book, and includes the names of the more important foreign genera. With Engler's sequence of Families we have only one quarrel. We certainly prefer our English separation of Fumariaceae and Papaveraceae; and, though we accept the position of Droseraceae between Resedaceae and Crassulaceae (among British Families), we consider the lumping of Sarraceniaceae, Nepenthaceae, and Droseraceae into one Order Sarraceniales to be an example of the too great reliance that German botanists have always placed upon purely physiological analogies. We do not like the separation of Balsaminaceae from the Geraniales; but most of all do we object to the placing of Cucurbitales between Dipsacaceae and Campanulaceae, in lieu of its former position, with Passifloraceae and Begoniaceae, in the neighbourhood of Parietales and Myrtiflorae.

"The Practical Book of Garden Architecture." By Phebe Westcott Humphreys. 8vo., 330 pp. (Lippincott, Philadelphia and London, 1914.) 21s. net.

It is to be regretted that this book describing American ideas upon garden design, many of which are both new and suggestive for English gardens, has been published at a moment when thoughts are centred upon economic work, and we can plan only how best to obtain the highest yield from land. It will only be when peace returns with prosperous, restful days that English gardens can be beautified. Meanwhile, it is interesting to note the most striking results of Mrs. Humphreys' experience.

American gardens are considered primarily as an extension of the house. Even the smallest suburban villa is an example to us of how to create and use out-of-door living-rooms. Whether it be the porch pergola, a somewhat verandah-like structure, or the floating garden, a flower-boxed barge to be propelled by secret cables, amidst beds of lovely water-lilies, to the thatched tea pavilion where rainproof rooms are filled with books for study, the one aim is kept in view—to live much out of doors.

We read of swimming-pools, and close beside them ornamental bath-houses with their pretty roof gardens. Upon either side of the dressing-rooms wide pergolas, painted white, lead to red-tiled spaces where tea can be taken under the shadow of overhanging vines. Then, too, those unsightly windmills, used sometimes for raising water, are converted into picturesque Dutch towers, surmounted by a dome. The lower part of the structure is fitted up either as a playhouse for children, an artist's studio, or a garden storehouse.

But it should not be thought that imaginative ideas upon a large and expensive scale are the only ones. Many excellent practical suggestions are given for small gardens. For instance, a terrace retaining wall, built of sleepers, or, as they are descriptively called, "railway ties," and stones, would be useful in a villa garden. The mention of a few goldfish being all that is required to keep a lake free from larvæ and "wrigglers" (mosquitos) is good. Then, too, there is a practical account of the best way of applying copper sulphate in order to free water from the green Algæ or "scum" that so often forms upon the surface. These hints, together with particulars of heavy glass espalier walls, upon either side of which the same varieties of fruit-trees are trained so that experiments can be made as to which aspect suits best, are all of interest.

A criticism that may be suggested is that but little space is devoted to the best water reflections, and how they are obtained, and no pictures are given showing well-shaped outlines of lakes and ponds. So much depends upon varied contour and clever imitation of natural lakes. Then, too, height in the garden, to be achieved by placing tall features in the centre of beds, which is much done in French and Italian gardens, is insufficiently dwelt upon. These points, together with a study of proper proportions, whether in the width and length

of avenues and pergolas or in the shape and size of flower-beds, are what impress most in famous European gardens. This book should, however, prove an incentive to English gardeners, who sometimes err in devoting all their energy and good taste to the growing of plants and not to the use of them in the garden. They either omit garden design or else introduce it so plentifully, without due regard to suitable surroundings, that restfulness is lost. Mrs. Humphreys' belief in proper restraint, and her warning against "overdoing" and "incongruity" as regards garden design, will be welcomed by the educated, artistic women gardeners, who are now being very generally employed for such skilled work in English gardens.

"Field Crop Production." By Prof. George Livingston, Assistant Professor of Agronomy, Ohio State University. 8vo. xix + 424 pp.; illustrated. (The Macmillan Co., New York, 1914.) 6*s.* net.

"Forage Plants and their Culture." By Charles V. Piper, M.S., Agrostologist in charge of forage crop investigations, Bureau of Plant Industry, U.S. Dept. of Agriculture. 8vo. xxi + 618 pp.; illustrated. (The Macmillan Co., New York, 1914.) 7*s.* 6*d.* net.

"A Text-book of Grasses." By A. S. Hitchcock, Systematic Agrostologist, U.S. Dept. of Agriculture. 8vo. xvii + 276 pp.; illustrated. (The Macmillan Co., New York, 1914.) 6*s.* 6*d.* net.

These three volumes belong to the Rural Text-book Series which is being brought out under the editorship of Professor L. H. Bailey, whose writings on agricultural and horticultural subjects are well known and much appreciated in this country.

Although written from the American point of view, they contain much that is of interest and value to students and others interested in rural subjects in this country, and also many hints as to the cultivation and handling of crops that the practical man might find it to his advantage to apply in working an English farm.

The volume devoted to field crop production deals with the rotation of crops and then describes in detail the cultivation of cereals, legumes, forage and fibre crops. Some of these, such as maize, rice, and millets amongst the grains, and cotton amongst the fibre crops, are unfamiliar to us in this country, but figure largely amongst the crops of the farmer in the United States. The same applies more forcibly in the case of the forage crops dealt with in the second of the three books mentioned above. The hot summers enable a large number of tropical and subtropical plants, such as ground-nuts, millets, &c., to be grown which would not succeed in this country, but many of the crops mentioned are common on English farms, although they are not so important here as in the United States; for instance, alfalfa (lucerne) is said to be at the present time the third most important forage crop in America, being exceeded only by timothy grass and red clover.

The book of grasses has special reference to the economic species of the United States. It is divided into two parts, the first

of which treats of grasses from an economic point of view, and the second deals with the natural history of grasses, their classification and nomenclature.

The books are well printed and illustrated, and the information is given in the concise and convenient form which we expect to find in American publications intended for students and practical men.

"Sweet Peas and Antirrhinums." By William Cuthbertson. 8vo. 119 pp. (Clarke, London, 1915.) 1*s.* net.

A sound, practical book, by a man who writes his own experience in a clear, masterly manner, is always sure to be popular, and we prophesy popularity for Mr. Cuthbertson's book. The author does not waste space on the origin and history of the Sweet Pea, but having dealt briefly with this subject he launches out on Sweet Pea culture for the average man. This is just what we want. Much has been written on growing this valuable flower for exhibition, and we venture to think the vast majority care very little for such instructions, but will greatly appreciate the information for the average man, who wants plenty of good flowers for cutting, and who cares little or nothing about exhibition blooms. All the same, if the grower wants to know how to grow Sweet Peas for exhibition, capital instructions are given in the next chapter, followed by a chapter on culture under glass. It will astonish most people to learn that a growth 22 feet long has been made by the variety 'Mrs. Cuthbertson,' and the skill of Mr. Ireland, Messrs. Dobbie's able grower, has been in evidence in London exhibitions on many occasions. The best varieties to grow, diseases, and insect troubles are all carefully dealt with, and we advise every Sweet Pea grower to get a copy of the book.

Although the Snapdragon (*Antirrhinum majus*) has been known for so many years and esteemed in cottage gardens, it is only comparatively recently that its undoubted merits have become recognized by the rich, and we feel confident that this flower will be indispensable in every garden very soon. It is so easy to grow, gives a magnificent display at a very small cost the same year as sown, and produces great masses of gorgeous flowers all through the season. We welcome this portion of a delightful book for these reasons.

"The Practical Book of Outdoor Rose-growing for the Home Garden." By George C. Thomas, jr. 8vo. 157 pp. (Lippincott, Philadelphia and London, 1914.) 16*s.* net.

This book contains some 150 pages of printed matter, ninety-six coloured plates, charts, and a few half-tones, and is certainly a weighty volume, for it weighs nearly 3 lb., or about twice the weight of Lord Rosebery's "Napoleon," a book of about the same size.

Many plates, which are taken by the autochrome process, form the most noticeable part of the volume. These plates show a large number of Roses of different varieties, and some of them are quite beautiful. The thing that immediately strikes

one, however, is that this process gives a fair representation of the true colour only within somewhat narrow limits. The art colours, that is the shades of salmon, orange, and yellow, are good, but the greens are often very unpleasing, while the crimson Roses depicted give a very inaccurate idea of the true colour of the flower. Moreover, the flowers have in many cases been photographed in a very immature state, merely as buds, some of them having their outer petals turned back in a rather unnatural manner, such as we are familiar with at some of our shows, and which lead judges to declaim against "overdressing." For instance, 'Earl of Warwick,' normally a rather full Rose, is shown as a thin bud in a way which gives little idea of the flower as generally seen.

The text is open to a certain amount of criticism. Thus, after referring to the introduction of 'La France' in 1867, it is stated: "The next Hybrid Tea that appeared and stood the test of time was 'Reine Marie Henriette,' raised by Levet in 1878." This seems a little misleading, for 'Captain Christy' and 'Cheshunt Hybrid,' the latter the first Rose to be called a Hybrid Tea, were both introduced in 1873, and are probably quite as popular as 'Reine Marie Henriette.'

Again, we are told that "in 'Roses and Rose-growing' Miss Kingsley states that the Banksias and some of the Multifloras, such as 'Crimson Rambler,' and one Noisette, 'Fortune's Yellow,' only flower on the sublaterals, *i.e.* on wood three years old. We knew that 'Crimson Rambler' needed practically only thinning, but were ignorant of the interesting fact regarding the sublaterals." The statement seemed so contrary to our experience of 'Crimson Rambler' in this country that it was thought worth while to refer to Miss Kingsley's book, where, on p. 20, we find the following passage: "The Banksias, some of the Multifloras such as 'Aglaia,' and that beautiful Rose 'Fortune's Yellow,' only flower on the sublaterals." Of 'Aglaia' the statement is more or less true, but not, in this country at least, of 'Crimson Rambler.' It is fair to state that the edition we referred to is published by Whittaker, while the author gives as his authority an edition by the Macmillan Co., and it is possible there may be a difference between the two editions, but would it not have been better if before publishing this statement, however interesting, the author had taken the trouble to look in the garden to ascertain the fact?—when he would have found that 'Crimson Rambler' flowers freely on laterals from the wood of the previous year as well as on the sub-laterals from two-year-old wood.

In another place we find the Rose 'Pierre Notting' compared with the Tea Rose 'Alexander Hill Gray.' Now 'Pierre Notting' is a Hybrid Perpetual, brought out in 1862, and carmine-crimson in colour, and the Rose intended to be referred to must be the Tea Rose 'Souvenir de Pierre Notting,' which, like 'Alexander Hill Gray,' is of a yellow colour. In so far as this may indicate a desire for the simplification of Rose names we have much sympathy with the author, but surely, if confusion is to be avoided, the desired reform must be carried out by

some other means than by the use of a name already appropriated to another flower, while it seems to us somewhat slovenly in a serious book to refer to 'Frau Karl Druschki' and 'Jonkheer J. L. Mock' as 'Druschki' and 'Mock' respectively.

A whole chapter is devoted to advice as to ordering Roses from nurserymen, and forms of suggested correspondence for the purpose are given, each order being preceded by a letter of inquiry, asking for answers to certain questions. We cannot help thinking this rather unnecessary, and that most amateurs are quite capable of expressing their wants in a single letter. But no doubt the author is right in advising amateurs to have nothing to do with grafted Roses for outdoor planting.

In the chapter on pruning we notice with pleasure some useful remarks on how Rose blooms should be cut, a subject well deserving attention, which is not often dealt with in books on Roses. And in the descriptive list of different varieties we find a praiseworthy attempt to estimate the value of each variety with reference to its hardiness, foliage, form, colour, and other qualities. This list contains just under 150 varieties, and the author states that he has removed from it all Roses which in the matter of hardiness came as low in his scale as D, or "poor." It would be impertinent to criticize its details, for the conditions of climate in America are doubtless very different from those which obtain here, but the list contains so large a proportion of Roses of recent introduction that one may surmise that in many cases the tests he has applied are unlikely to have been of any extended duration.

"Wonders of Plant Life." By F. M. and L. T. Duncan. Sm. 8vo. 6 vols. 80 + 78 + 79 + 76 + 79 + 78 pp. (Frowde, Hodder & Stoughton, London, 1914.) 1*s*. net each.

This popular account of plant life, contained in six small copiously illustrated volumes, will be read with interest by many. The titles convey a good idea of the contents. "The Story of the Plants," "Plants and their Children," "Land and Water Plants," "Plant Traps and Decoys," "Some Curious Plants," and "Plant Friends and Foes" are the subjects dealt with. The illustrations are partly coloured, partly black and white, and are from photographs as a rule. Some, especially those of insects, do not show at all clearly the characters of the creatures they are intended to portray.

"Agriculture, Theoretical and Practical." By J. Wrightson and J. C. Newsham. 8vo. xx + 628 pp. (Crosby Lockwood, London, 1915.) 6*s*. net.

The only claim of this book to notice in this JOURNAL is contained in Part V., which deals with horticulture in ninety pages of small print. In it the main functions of plant life are dealt with, and fruit, flower, and vegetable growing, the first fairly fully, the last very cursorily,

treated. Marketing methods and fungus attacks upon plants have some few pages devoted to them, but insect pests of garden plants receive no special treatment.

"The Principles of Irrigation Practice." By J. A. Widtsoe, A.M., Ph.D., xxvi + 496 pp. 8vo. (Macmillan Co., New York, 1914.) 7*s*. 6*d*. net.

Like all the books in the "Rural Science Series," this is a first-class manual of the subject with which it deals. There are vast tracts of land in various parts of the world that await only a constant water supply in order to render them capable of producing valuable and remunerative crops. And there is need for a book bringing together what has been written upon the subject, for irrigation is not a simple matter of engineering to bring water from a more favoured to an arid district. As with every other work of man, interference with the existing order of things brings about new conditions which were not apprehended at the outset, and which experience alone enables one to define. With the new conditions new problems arise, and these when competition becomes more keen have to be solved. All this is dealt with in the present volume, and those who have to deal with irrigation problems, or with irrigation practice, some of which might be applied with advantage in parts of our own country, will find much instruction in this well-illustrated and clearly written book and its companion "Dry Farming." Probably in horticultural practice sub-irrigation will be more likely to prove of value than is indicated in the brief note upon it in the present volume.

"A Manual of Weeds." By A. E. Georgia. xi + 593 pp. 8vo. (Macmillan Co., New York, 1914.) 8*s*. 6*d*. net.

Over 560 pages of this book are occupied by descriptions of weed-plants, as the authoress defines them, which are apt to grow where something else is desired. They are the weeds in the United States, not weeds of all cultivated land. The book may thus be looked upon as a descriptive list of the most common American wild plants. The descriptions are not too technical, each plant is illustrated by a line drawing generally faithfully representing the form of the plant depicted, and notes of habitat, crop liable to be infested, and range and methods of control are given. A surprising number of the plants referred to occur in England, while still others are welcome garden plants here.

"Inorganic Plant Poisons and Stimulants." By Dr. Winifred E. Brenchley. 8vo. x + 110 pp. (University Press, Cambridge, 1914.) 5*s*. net.

Recent research into soil problems along several lines has pointed to an almost unsuspected importance attaching to the presence of minute traces of certain chemical compounds in the soil. In the present monograph the authoress has brought together the statements of many writers upon the effects of inorganic substances in

poisoning and stimulating plants, and compares these effects under different conditions. She shows that the frequently repeated generalization that a very minute quantity of a poison is a stimulant is not always true, and that a poison may behave very differently when in soil as compared with its behaviour in water cultures. She does not make it clear, however, whether this difference is due to the presence of other compounds which may react with the poisonous one, or to physico-chemical effects. She has produced an indispensable book of reference on the interesting and important subject with which she deals, and one which no serious student of plant growth can afford to ignore. A lengthy bibliography is given at the end of the book, which, though not exhaustive, will be very valuable.

"The Flower-Finder." By G. L. Walton. 8vo. xxvi + 394 pp. (Lippincott, Philadelphia and London.) 8*s*. 6*d*. net.

An introduction gives notes upon the form of plants, so as to make the novice acquainted with common botanical terms; the bulk of the book arranges American wild flowers under keys, so that they may be "run down" from the flower or the fruit. Notes on the habitat, derivation of name, and occasional legendary lore and poetical allusions, accompany a simple description of each plant, and most are figured by an outline drawing frequently showing details, and there are also several plates from photographs. The Latin name of each plant (frequently accented for pronunciation) and a "common" name, which, as is usual with such names, is not always in common use, head the descriptions. The system of classifying flowers by their colour, for ease in identification, while useful for that purpose, often leads to the separation of very nearly related plants, and this is to be regretted, though probably those interested by their initial study will not be content to leave off where this excellent little book leaves them, but will pursue the subject further and learn more of the relationships of plants to one another and to the animate and inanimate world around them.

"The Herbaceous Garden." By Alice Martineau, with an Introduction by W. Robinson. 8vo. 298 pp. (Williams & Norgate, London, 1913.) 7*s*. 6*d*. net.

Though the title of this book seems to fix severe limitations to its contents, the wide experience and practical knowledge of the writer have enabled her to fill no less than thirteen chapters with sound views and useful instruction for the formation and upkeep of a garden containing all that is really worth growing in the open air. A chapter devoted to the subject of the site gives the writer an opportunity of discussing trees and yew hedges as backgrounds. Further chapters concerned with design, colour, or the massing of species open the way for descriptions of many famous and well-known gardens, and others

deserving notoriety if even half as beautiful as they appear under Mrs. Martineau's pleasantly-worded praise.

A chapter is devoted to annuals and bulbs, and the scope of the book is thereby enlarged to embrace all hardy subjects except flowering shrubs, which only receive mention as suitable for backgrounds or providing shelter.

Everywhere one finds evidence that the writer has both seen and handled the plants described, and herein lies the true value of the book. Too seldom does one find a gardening book in which practical hints and questions of cost are at one and the same time so obviously the result of successful experiment, and yet are stated in such readable, natural, unaffected, even conversational language. This makes even dull details of digging and manuring pleasant to read and easy to understand.

The many illustrations are well produced, and represent delightful pictures in gardens of many styles. The spelling of Latin names and a somewhat irregular use of capitals and italics call for revision in any future issues of the book. One is rather shocked with such a printer's error as the word *Sortelli*, which may possibly represent the specific name of *Iris Lortetii*, and it is disappointing to learn from the remark on p. 36, "there are ninety varieties of *Salvia* and eighty, at least of primulas," that the authoress has not found out there are over five hundred *species* of the former, and when Pax and Knuth issued their monograph of the Primulaceae in 1905 they were able to record 208 species of *Primula*. The last ten years of Chinese expeditions have added over 150 species, and from other sources many more have been added, as Prof. Bayley Balfour stated in his paper read at the Primula Conference in 1913.

A useful feature of the book is an alphabetical list of plants suitable for Herbaceous Borders, as concise descriptions and good cultural directions are included. Therefore it should prove of service to many good gardeners who wish to be reminded of good plants and pleasing colour combinations, as well as to the novice who is planning a new garden.

"Home Landscapes." By W. Robinson. 4to. 78 pp. (John Murray, London, 1914.) £2 12*s*. 6*d*. net.

From other examples of Mr. Robinson's later work, one is led to expect any new book by him will be sumptuous in every way possible as regards paper, type, and illustration, and that somewhere in its pages will be found a strongly-worded protest against formality and the topiary art.

In this large quarto volume we find excellent examples of all. The wealth of photographic reproductions is rich indeed, and it is unnecessary to say more in proof of their artistic and technical perfection than to mention that they were all taken by Mr. George Champion. Each view has an accompanying page which more or less describes what has been done to achieve the effect obtained.

It is a difficult task to write something interesting and useful about thirty views, many of which chiefly depend for their charm on the natural beauty of a southern county renowned for its landscapes rather than upon the clearance of brambles and undergrowth that has opened up the foreground.

It is when we come to scenes in the beautiful Heath Garden and by the lakeside that we find the more valuable hints for the development of ground suitable for such plantings. As a souvenir of beautiful Gravetye, and the many fine views so wisely opened out by its owner, the book is a delightful possession.

"The Art of Landscape Architecture: its Development and its Application to Modern Landscape Gardening." By Samuel Parsons. 8vo. 347 pp. (Putnam, New York and London, 1915.) $3.50 net.

The main object of this book is to show by quotations from experts and poets, past and present, how landscape gardening has developed, built up as it has been upon the experience and observation of bygone artists. It teaches how study of Nature and the best examples are necessary before successful work can be accomplished. Only very lightly are formal gardens touched upon, for the author deals with park-like grounds usually known in Europe as "jardins anglais," of which the "Petit Trianon" is a good example.

Milton may well be considered as the precursor of this "natural style," for his "Paradise Lost," although written about the time when the formality of Versailles was being developed, shows clearly the foreshadowing of change in fashion, which was bound to follow. This return to natural planting was further assisted by accounts of Chinese landscape gardening sent home about 1690 by the Jesuit Father Attiret and his fellow missionaries. Rousseau, Pope, and many others took up the same ideas, which later on Repton and Prince Pückler lent careful study to until this Fine Art reached the artistic success of modern days.

Perhaps Mr. Parsons' high ambitions for future Garden Craft are best expressed by Benedetto Croce, who says: "He is a true poet (landscape architect) who feels himself at once bound to his predecessors and free, conservative, and revolutionary, like Homer, Dante, and Shakespeare, who receive into themselves centuries of history, of thought and poetry, and add to those centuries something that is the present, and will be the future; *chargés du passé, gros de l'avenir.*"

It is inspiriting to find a place of honour given to the theories of Repton and Prince Pückler, because their views are yet insufficiently known by many who profess to be good gardeners.

Other important points that are dwelt upon are a careful consideration of the rights and desires of the public in the arrangement of Public Parks, the national requirements too which lead to such grounds being designed so that they exercise potent and vivifying influence upon the mind. The author emphasizes the advantages of "careful maintenance." Through persistent exercise of this alone the original

intention conceived in the construction of a park or garden is often more clearly defined fifty years after it was laid out than at the time of planting.

The hand of the master or educated foreseeing head gardener is required. In some cases it is wanted to stimulate slow growth, and in others to restrain over-luxuriance, so that it shall not be said that "one cannot see the woods for the trees." This watchfulness, this shaping of the ground, so well described in an admirable chapter which contains the author's own words and but few quotations, should become increasingly the aim of future gardeners. Only artistic, refined, well-educated men and women can supervise the manual work which is necessary to the degree that is now required, and guide so that mistakes of taste are few.

Thus will Garden Craft, that most ancient industry of the world, be restored to the high position which it once held, when men kept in view how indispensable it is and always has been to the moral and physical health of a nation.

In giving this book to a student we are compelled to feel regret that the illustrations are not more helpful. The plates being unnumbered, and the details in each not being alphabetically marked, the explanations in the text are not easily understood. Had all been as clearly suggestive as "The Gates of the Highlands" on page 70, the lessons that Mr. Parsons gives to the public would have had a more far-reaching influence.

"Our Sentimental Garden." By Agnes and Egerton Castle. 8vo. 305 pp. (Heinemann, London, 1914.) 6*s*. net.

It is not a little difficult to assign a place for such a book as this. It is about a garden, yet not alone of the garden but of men and things in it and about, of the design of it and how the design grew, and of pleasures and disappointments until it attained its present beauty—a book of "content and all harmless ways of life," which "may perchance help to beguile thoughts surfeited with tales and pictures of mortal strife."

Their task, begun with no thought of providing relaxation in such times as these, and finished after the war cloud burst and swamped Europe with horrors, has come at an opportune time, for its authors may rest assured it will help many to turn their thoughts to peaceful times and give that relief from strain which a garden can always give when it is a personal garden. Not only will this garden give pleasure to its makers, happiness to the wounded, shelter to the refugees, but the reading of its story will take many in spirit to quiet and beautiful nooks away from thoughts of spoliation to the contemplation of the garden, perhaps the *spolia opima* of man's combat and co-operation with Nature.

No review of its contents can give a sufficient idea of the book, and we can only say how much it pleased us, both as regards its text and its illustrations.

"The Story of Plant Life in the British Isles." By A. R. Horwood, F.L.S. Vol. III. 8vo. xvi+514 pp. (Churchill, London, 1915.) 6*s*. 6*d*. net.

We wish we could say the whole of this book was as good as the excellent frontispiece, for its aim is excellent; but, like its two predecessors, it is in many places discursive and unreliable. Of *Wolffia arrhiza, e.g.*, it is written: "About the size of a grain of sand; the fronds are $\frac{1}{2}$ inch long by $\frac{1}{4}$ inch broad, are thick, and swollen underneath, subglobular, linear, oblong, flat above, loosely cellular below, cleft near the base, solitary at the base. The young frond separates from within the base of the old one, and is soon detached. The walls of the epidermal cells are straight." Hooker gives a fuller, more accurate description, in fewer words: "Fronds like grains of sand, rootless, oblong or subglobose, flattened above, loosely cellular beneath, proliferous, cleft near the base; $\frac{1}{20}$ inch long, $\frac{1}{40}$ inch broad; young solitary at the base of the old, soon detached; epidermal cells with straight walls"; and while the generic characters and this species are described by Hooker in fourteen lines, a page and a half are occupied in this book by a confused, inaccurate description which tells us nothing Hooker omits or indicates.

The book is well produced, in grey cloth binding, and well printed in open type. Many of the illustrations are excellent pictures of the plants they represent, but some might well have been more clear.

"The Principles of Agriculture through the School and the Home Garden." By C. A. Stebbins, M.S. 8vo. xxviii + 380 pp. (Macmillan Co., New York, 1913.) 4*s*. 6*d*. net.

This is a book about many things all more or less connected with rural life, and it is apparently intended as a school reader. In this country it will be of more value to the rural school teacher than to anyone else, but all interested with the re-population of country districts and with keeping the connexion between the people and rural industries will profit by its perusal, though it is scarcely to be expected that they will agree with all the suggestions put forward.

Plant life, the soil, the school-garden, the rural home, personal and communal hygiene, insects and disease, birds and insects, the advantages of rural life, and the like are the author's themes, and they are all stated in terms of child life and illustrated by numerous small figures of children and gardens, not all very well reproduced.

"Soil Conditions and Plant Growth." By E. J. Russell, D.Sc. Ed. 2. 8vo. viii + 190 pp. (Longmans, Green, 1915.) 5*s*. net.

A second edition of this useful summary of the present condition of Soil Science has soon been called for, for the first appeared in 1912. Progress is continually being made in various directions, but perhaps most actively in the investigation of the relationship between the

microflora of the soil and the growth of plants, a line which has been developed to a considerable degree at Rothamsted Experimental Station, which the author directs, and this has called for a new chapter in this edition. Perhaps, in the present state of knowledge of soils, and the brevity necessary in such a monograph as this, it is inevitable that the account, masterly as it is, should seem somewhat inconsecutive. The problems presented are so many-sided and the literature so scattered that it is a remarkable achievement to compress the multitude of facts into so small a space, and to correlate them as the author has done. Investigators owe him thanks, too, for pointing out directions in which further research can be profitably undertaken, and the bibliography adds much to the value of the book to students.

"My Shrubs." By Eden Phillpotts. 4to. 132 pp.; with 50 illustrations. (John Lane, London and New York, 1915.) 10*s*. net.

"My Shrubs" is a charming book, and will be a welcome acquisition to the cultivator of hardy and half-hardy plants, while the illustrations and general get-up of the work are everything that could be desired, and, as might be expected from the author, it is a pleasantly written book.

At the outset, it is, however, well to remind the reader that the shrubs mentioned include hardy, half-hardy, and greenhouse kinds, and many, too, are little known outside the walls of a botanic garden. The writer has a thorough knowledge of his plants and their peculiarities; indeed, rarely have we read a book on shrubs that so reflects our own ideas on their value for ornamental planting. It is not, of course, possible for every cultivator to provide indoor winter quarters for the tender species, not to speak of the work entailed by keeping them in pots and transferring them annually to their out-of-door positions in the garden, but the beauty of flowers of many of these half-hardy and greenhouse species makes up for the labour expended in their cultivation. Dwarf forms of trees are always interesting, and the writer seems to have a good selection, though there are others that might well be added to the list, including the pigmy form of the common hawthorn and a form of our native Juniper which grows in the famous collection at Murrayfield, Edinburgh.

It is curious that the Bear's Grape, *Arctostaphylos uva-ursi*, does not succeed with Mr. Phillpotts, for we have no trouble with it even in London, but it wants a dryish rather than a damp soil. The Nevada species does charmingly beside the latter, but in cooler soil. We have found the Osage Orange (*Maclura*) wants a gravelly subsoil with good loam atop, and if confined only to one species of Magnolia we should certainly name *M. stellata* for the garden of moderate proportions.

Sutherlandia frutescens is a charming shrub, but it cannot be depended on in this country any more than can some of the rare and more beautiful members of the Rhododendron family.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

The Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of giving references to papers, as the observance of an identical *order* renders subsequent reference to the original easy. The order is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 146, 147.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

Names of those who have kindly consented to help in this Work.

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Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales . .	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope . .	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort. .	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg . . .	Ann. Jard. Bot. Buit.
Annals of Botany	Ann. Bot.
Beiheft zum Botanischen Centralblatt . .	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d' Orticultura.	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France .	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret . . .	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France . .	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane . .	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne .	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica .	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations .	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium . .	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria . . .	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand .	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées . .	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria . . .	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research . . .	Jour. Agr. Research.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology . . .	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture . . .	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society . .	Jour. R.A.S.
Journal of the Society of Chemical Industry .	Jour. Soc. Chem. Ind.
Journal S.E. Agricultural College, Wye . .	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.

Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst . .	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society .	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal . . .	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden . .	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh . . .	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc. .	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc. .	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc. .	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins .	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports . .	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications .	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report . . .	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.
† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Acacias, An Economic Study of. By C. H. Shinn (*U.S.A. Dep. Agr., Bull.* 9, December 5, 1913).—The Acacias are so valuable as a source of tanning material and of timber, and so well adapted to the reclamation of sandy semi-desert lands, that their introduction into parts of the United States may prove profitable.

They are in the main, natives of Australia, which has about 300 species. There are 150 other species scattered over the world, principally in Asia, Africa, and America, with one important species, the Koa, in the Hawaiian Islands. Of the 450 not more than 75 have a known economic value, and not more than 50 are in general cultivation, though 150 species are growing in nurseries, gardens, and arboreta in the United States.

So far as is known, no other semitropic trees of high economic value possess to as great an extent the ability to thrive upon and to improve a great variety of arid and sterile soils. Through their agency large areas of land unfit for ordinary cultivation, and at present producing only a scanty pasturage at best, may be reclaimed and utilized. Recent discoveries in the nitrogen-fixing qualities of the legumes point to the possibility of a hitherto unrecognized value in Acacia-growing.

Some Acacias have a remarkable value for the reclamation of sand dunes, whether they are seashore drifts or inland barrens.

Many species furnish tan-bark; others yield forage; others produce timber of notable quality; almost all are suited to ornamental plantings, many are excellent for street trees and for shelter belts, and several furnish many special products of great economic value.—*A. D. W.*

Acid and Alkaline Solutions, The Effects of, upon the Water Relation and the Metabolism of Plants. By Alfred Dachnowski (*American Jour. of Botany*, vol. i. No. 8, Oct. 1914, pp. 412–440; 4 figs.).—A series of experiments was devised to determine what importance hydrolytic reactions may have in regulating and determining the amount of water absorbed and retained by plants during germination and growth Both seeds and cuttings of plants were used.

The chief conclusions arrived at were:—

1. Seeds of *Phaseolus multiflorus* swell more and retain greater quantities of water in the solution of any acid than in distilled water.

2. The amount of water that seeds absorb and retain in an acid solution is not dependent upon the concentration of the acid and is not a function of it.

3. When equinormal acids are compared the amount of water retained is greater in sulphuric acid than in hydrochloric or in nitric acids. The first two acids are about equally dissociated and yield a greater concentration of H ions than the equinormal nitric acid, but the amount of water retention induced seems to be determined not by the concentration but by the anions of the particular acid. The order of effectiveness of the anions in accelerating the water content is SO_4, Cl, and NO_3.

4. The addition of any salt to a solution of HCl $n/800$ does not decrease the quantity of water absorbed or retained by seeds of *Phaseolus*. The amount retained is increased if K_2SO_4 is added. A higher concentration of any salt is followed by inhibition in the capacity for absorbing and retaining water. In a series of salts having a common anion, the order of effectiveness of the kation is K, Na, and Ca, the ion most effective being placed first.

5. The conclusions on the absorption and retention of water by seeds in the alkaline solutions are the analogue of those for the acids. Seeds of *Phaseolus multiflorus* absorb and retain more water in solutions of any alkali than in distilled

water. These seeds swell more in KOH than in NH_4OH, and more in either of these than in $Ca(OH)_2$ or NaOH, in the order named. The kations Ca and Na are apparently more active in bringing about a reduction in the water content than either NH_4 or K.

6. In equinormal solutions of acids and alkalies, it is found that these seeds swell less and retain much less water in an acid medium than in an alkaline solution.

In similar experiments with seeds of *Zea Mays*, corroborative results were obtained.

In further experiments, cuttings of tomato plants were used. The chief results obtained were:—

1. During 15 days the cuttings absorb and transpire less water in an acid solution than in distilled water.

There is a great difference in the relationship between the quantity absorbed and transpired and the concentration of the acid. A point is reached in the solution of HCl and H_2SO_4, beyond which a further increase or decrease in concentration is followed by a diminished absorption or loss of water; while in solutions of HNO_3 and $CH_3CO.OH$ (acetic acid) the absorption and transpiration of water vary inversely as the concentration.

2. At the concentrations employed, the absorption and transpiration of water by tomato plants in alkaline solutions are less than in distilled water. The kations, in their order of effectiveness, bringing about the least inhibition, are K, Na, Ca, NH_4. Beyond a certain optimal point a further increase or decrease in concentration leads to a diminished water relation.

There is appended a short bibliography giving references to this subject.

A. B.

Acid Lands, Agricultural Utilization of, by means of Acid-tolerant Crops, The. By Frederick V. Colville (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* Sept. 1913; 13 pp.).—The author describes the use of certain acid-tolerant agricultural plants where liming is an economic impossibility.—*C. P. C.*

Acid Soils of Porto Rico, Studies on. By Oscar Loew (*U.S.A. Exp. Stn. Porto Rico, Bull.* 12, Oct. 1913, pp. 23).—Some studies on the acid clays of Porto Rico, showing the value of liming, the consequent increase of the azotobacter, and the diminution of butyric ferments.—*C. P. C.*

Aconitum rotundifolium (*Bot. Mag.* tab. 8575).—W. C. Asia. Nat. Ord. *Ranunculaceae*, tribe *Helleboreae*. Herb, 6–16 inches high. Leaf-blades suborbicular, much divided. Flowers in racemes. Sepals greenish-white, with violet veins, and flushed with purple or violet.—*G. H.*

Aesculus, New Species. By W. J. Bean (*Kew Bull.* No. 2, p. 50, 1914).—*A. chinensis* (not *A. turbinata*, which has been grown under the name of *A. chinensis*) introduced by Purdom in 1912, from North China, and *A. Wilsonii*, collected by Wilson in West Hupeh, are described. The former appears to be quite hardy, but there is still a little doubt about the latter.—*F. J. C.*

Afforestation of Waste Lands, Average Returns from the. By P. Trentham Maw (*Quart. Jour. of Forestry*, vol. ix. No. 1, pp. 18–33; Jan. 1915).—Many experts are fond of quoting examples of the returns obtained from German forests, but evidence of this nature is apt to be most misleading. If forests are properly stocked, and have approximately equal areas under crops representing all ages from one year old up to maturity (when they are said to be "normally stocked"), they should, of course, yield a large average income per acre, but the capital expended in obtaining that income is often enormous, so much so that an income of £2 per acre may, in fact, prove to be a great loss if the undertaking has been financed at 3 or 3½ per cent. interest.

In conclusion, I desire to express the opinion that there are vast areas of land below an altitude of 750 feet above sea-level which it would pay well to afforest. Such land is now, much of it, let for farming purposes at rentals varying from 5*s*. to 7*s*. per acre; whilst there are also huge tracts of equally good land now lying waste, or subject to rights of common, the annual value of which is very slight. Without doubt, upon economic grounds, much of this common land should be afforested. There are, I know, difficulties in the way—commoners, even if compensated, are loth to have their rights interfered with—and yet I believe these difficulties are not insurmountable, if only they are approached in a proper manner.—*A. D. W.*

Agave bracteosa (*Bot. Mag.* tab. 8581).—N. Mexico. Nat. Ord. *Amaryllidaceae*, tribe *Agaveae*. Shrub, almost stemless. Leaves about 50 in a rosette, 2½ inches wide, with a long acuminate tip. Pole 6 feet high, spike 2 feet long. Perianth green, white-margined.—*G. H.*

1. **Ammonifying Efficiency of certain Colorado Soils, The.** By W. G. Sackett. 2. **Algæ in some Colorado Soils.** By W. W. Robbins (*U.S.A. Exp. Stn., Col., Bull.* 184; 35 pp.; 4 plates).—A number of soils in the Colorado districts have so great a power of ammonifying various organic materials as to produce nitre-burning in many orchards, or even to destroy them.

Tables are given showing the effect of such soils on various organic fertilizers. The second part deals with the algæ present in the soils, with four coloured plates of the species. —*C. P. C.*

Apple Trees, Canker. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxv. pp. 1037–1044; 9 figs.).—Canker is due to injury of the cambium, which may be caused by frost, exposure to excessive heat of the sun, or to the action of fungi. Painting the tree with a thick coat of lime-wash is a remedy for sun scald. Bitter Rot or Ripe Rot is caused by *Gloeosporium fructigenum*, and Apple Blotch by some form of *Phyllosticta*; in either case prune out and burn all cankered twigs and spray with Bordeaux mixture. In canker on branches too large to cut out they are scraped and painted over with thick Bordeaux paste. Nectria Canker (*N. ditissima*) attacks the bark, often girdling small branches. It is not met with in orchards free from American Blight. Blight (*Bacillus amylovorus*) attacks the blossoms, twigs, and fruit, causing the leaves to shrivel and the blossom to turn brown. Small drops of a viscous liquid exude on the twigs and petioles. Lime-sulphur spray is the best remedy for mildew. There does not appear to be any cure for Crown Gall, which is caused by *Bacterium tumefaciens*.—*S. E. W.*

Apples, Technical Descriptions of. By J. K. Shaw (*Mass. Agr. Exp. Stn., Bull.* 159, Dec. 1914; 14 figs.).—This is a compilation from various sources of the description and selection of characters useful in describing apples. A new feature is the photographs of leaves, illustrating their shape and pose. Other than this the matter has been fully dealt with in many well-known works of reference.—*E. A. Bd.*

Aquatics (*Rev. Hort. Belge*, March and Ap. 30, 1914; plates).—Some notes on the cultivation of Nymphaeas and Nelumbiums.—*M. L. H.*

Armillaria mellea, The Death of Chestnuts and Oaks due to. By W. H. Long (*U.S.A., Dep. Agr., Bur. Pl. Ind., Bull.* 89, May 1914, pp. 1–9; 2 plates).—This fungus, under favourable conditions, can become an active parasite on chestnuts and oaks, destroying not only the crowded trees in the forest, but also those growing under more favourable conditions. It usually occurs at the base of the trees, and the black lace-like mycelium (rhizomorphs) spread downwards to the roots and upwards under the bark of the stems. This weakens the tree and ultimately destroys it completely. Of the chestnuts, 21 per cent. have been destroyed by the disease; while 27 per cent. of the oaks were killed from similar attacks in Chenango County, New York State.—*A. B.*

Azalea 'Mad. Petrick' superba (*Rev. Hort. Belge*, Feb. 1914, p. 52).—A new variety of *A. indica*, said to be a valuable novelty from its early flowering and perfect habit of growth.—*M. L. H.*

Azores, Notes on the Native Plants. By H. B. Guppy (*Kew Bull.* 1914, p. 305).—The flora of the slopes of the mountain of Pico is reviewed, with notes on the zones of vegetation.—*F. J. C.*

Bacterial Activity in Soil as a Function of Grain-size and Moisture Content, The. By Otto Rahn (*U.S.A. Exp. Stn., Michigan, Tech. Bull.* 16; June 1912).—The effects of grain-size and moisture content on bacterial activity is herein discussed. The author deduces that the larger the grain-size the higher the number of bacteria, and necessarily the increase in ammonia compounds.

It is also found that both the aerobic and anaerobic types thrive best in soils of large grain-size containing the optimum amount of water, anaerobic bacteria being more favoured by increasing quantities of water even to a waterlogging. Sands require far less moisture for the highest development of bacteria than clay or loamy soils.—*C. P. C.*

Bacterial Relationships of certain Soils, Observations on. By H. A. Tempany (*Jour. Imp. Dep. Agr. W.I.* vol. xiv. No. 2, 1914; pp. 146–152).—Summary. (1) To investigate changes likely to take place in soils under tropical conditions small plots of land were used as tests. Soils were sampled to a depth of 12 inches, determining the original content of organic carbon, nitrogen, and calcium carbonate. At the end of from twelve to fifteen months the soils were re-sampled, and the organic carbon and nitrogen were re-determined. An exactly similar process was carried out with lots of the original samples, which were kept in the laboratory for six months under moist conditions. Some of the soils were light, and some stiff and heavy.

(2) At the end of the experiment it was found that both in the field and in the laboratory considerable losses of organic carbon had taken place as the result of bacterial activity, the losses varying between 25 and 50 per cent.; in one case only small loss was recorded.

(3) With regard to the nitrogen contents, considerable decreases were seen in the field in some instances; in one case the loss was small. In the laboratory, an appreciable loss of nitrogen occurred in one case; in two cases no loss was observed, while in one case there was a small loss. The losses of nitrogen which occur in the field are attributed to nitrification and subsequent loss by leaching in two instances, and probably in some measure to denitrification in one instance. In view of the small content of calcium carbonate, the suggestion is made that ammonia formed in the course of ammonification may serve as a base for the neutralization of a part of the nitric acid formed in nitrification.

(4) The results emphasize the high degree of bacterial activity existing in tropical soils, and indicate the necessity of maintaining an adequate supply of organic matter.—*A. A. K.*

Balsam Fir. By Raphael Zon (*U.S.A. Dep. Agr., Bull.* 55, March 25, 1914).—Balsam Fir (*Abies balsamea* (Linn.) Mill.) is a small evergreen tree, seldom reaching, in the State of New York, a height of 85 feet and a diameter of 18 inches breast-high. In Maine occasional trees attain a height of 95 or 100 feet and a diameter of 25 or 30 inches. As a rule, however, mature trees are from 12 to 16 inches in diameter and from 70 to 80 feet high. Of all the northern softwoods, balsam fir is probably one of the most symmetrical trees. The bole has a very uniform and gradual taper, closely resembling a cylinder in form.

Balsam fir, though in general inferior to white pine and red spruce, is now a tree of considerable economic importance in the north-eastern forests. It constitutes numerically about 20 per cent. of the coniferous forests in northern New York and Maine, and is abundant in many parts of New Hampshire, Vermont, and in the swamps of northern Michigan, northern Wisconsin, and Minnesota. Through prolific seeding and rapid growth it readily reafforests cut-over areas and attains sizes suitable for pulp-wood in a short time.

Balsam-fir wood, while to some extent inferior to spruce for construction material, has a definite place in the pulp and lumber industries.—*A. D. W.*

Beans, Two Diseases of Michigan. By J. H. Muncie (*U.S.A. Exp. Stn., Michigan, Sp. Bull.* 68; March 1914, pp. 1–12; 1 plate and 2 figs.).—The two diseases described are: 1. Bean Anthracnose, which is caused by a fungus, *Glomerella* (*Colletotrichum*) *Lindemuthiana* (Sacc. and Magn.), Shear., and attacks the seeds, pods, and plants, forming circular dark-red spots, which frequently turn black, and ultimately cause the death of the plants. The disease is spread by the introduction of infected seed, and is favoured by wet weather and possibly by insects. Spraying is of little value. The disease can only be avoided by using clean seed.

2. Bean Blight, which is caused by a bacterial organism, *Bacterium Phaseoli*, E. F. Smith, and which only attacks varieties of beans and lupins. The germs are carried from one season to another in the affected seeds, and are doubtless scattered from the infected plants by the wind; they can resist drying for more than two hundred days. At present there are no effective remedies known to control this blight. The discovery of blight-resistant plants is at present the only way to eliminate the disease. Seed from uninfected areas is not recommended, because of its greater susceptibility to the disease.—*A. B.*

Bee Hives, Distance from Trees and Number of Hives Necessary. By F. R. Beuhne (*Jour. Dep. Agr. Vict.* p. 309; May 1914).—The distance to which bees will fly in search of pollen and nectar varies with the season and the weather. On warm sunny days bees will go a mile or more. On cold and cloudy days they

do not venture far, and during short snatches of sunshine would probably not visit flowers more than 100 yards distant, unless there is blossom to lead them on.

The bee is guided to the blossom by the sense of smell rather than that of sight. When a hive is located half-a-mile away from trees, the bees cannot be counted on as pollinators during unfavourable weather. The hives are best placed in a sheltered position, where they are shaded in summer, but have the full benefit of sunshine in winter and spring. This is most easily accomplished by putting them under trees which shed their leaves.

Observations made in the United States in recent years show that the nearer the bees to the trees the better the crop of fruit.

There are as yet no data available as to the number of hives required to furnish bees for pollinating the blossoms of a given number of trees under various weather conditions. Naturally a smaller number is sufficient during fine weather. It is certain that the more bees that are kept the better the results. There is, however, a limitation to the number of colonies a fruit-grower can keep permanently in his orchard, as the amount of bee food within the range of the bees' flight during the remainder of the year must be sufficient to maintain them and to provide winter stores.

Bees are valuable to cranberries. At Cape Cod on one side of a field of 126 acres of cranberries there were three or four colonies of bees, which were obviously inadequate to cover the whole field. The yield was found to be in direct proportion to the proximity of such acreage to the bees. The yield was heaviest close to the hives, and was lighter as the distance from the hives increased.—*C. H. H.*

Bee-keeping in Porto Rico. By E. F. Phillips (*U.S.A. Exp. Stn., Porto Rico, Bull.* 15, pp. 1–24; 4 figs.).—In coffee and citrus plantations bees are valuable aids to cross pollination.—*S. E. W.*

Begonia manicata. By Ad. van den Heede (*Rev. Hort. Belge*, April 1914, p. 123).—A note on the *Begonia manicata* and *B. manicata alba*, an interesting species which was introduced from Mexico in 1842, and which might be more generally cultivated. The plants are suited to the temperate house, and will even grow out of doors in summer.—*M. L. H.*

Birch, Black-knot of. By G. Massee (*Kew Bull.* 1914, p. 322; fig.).—The first symptom of this disease is the wilting and yellowing of the leaves, followed by the death of the branch, after which numerous lateral branches spring out below the dead one, the leading one in turn falling a victim, until a tuft bearing a superficial resemblance to a witch's broom is produced. The cause is said to be the fungus *Plowrightia virgultorum.*—*F. J. C.*

Cacao, The Budding of. By Joseph Jones (*Jour. Imp. Dep. Agr. W.I.*, vol. xiv. No. 3, 1914; pp. 181–186).—A certain measure of success has been achieved in budding of cacao stocks growing in bamboo pots. The method which yielded the highest percentage of success was that of patch budding. In this form of budding a portion of the bark is removed from the stock and a similar piece with an eye is carefully fitted in its place. When in position the bud is tied with raffia and then wrapped with budding tape in order to protect the scion and to exclude air and moisture. In about ten days the bud may be examined, and if signs of union are observed the tying may be cut or loosened and the tape again wrapped loosely around the stem as a protection for a few days longer until the bud can be exposed. When the young shoots have attained a length of from six to eight inches and become hardened the upper part of the stock may be removed.

This method of propagation is considered much better than relying solely upon seedlings, as all the latter do not yield either the same quality or quantity of seed. At present the best stock is *Theobroma Cacao* 'Calabacillo,' though a hardier stock is to be desired.

The length of time over which the trees may be considered commercially productive is from thirty to thirty-five years from first bearing.—*A. A. K.*

Ceratostigma Willmottianum (*Bot. Mag.* tab. 8591). China. Nat. Ord. *Plumbaginaceae*, tribe *Plumbagineae*. Shrub, freely branching. Leaves sessile, 1½–2 inches long. Heads terminal. Corolla ¾ inch across, bright blue.—*G. H.*

Citrus Canker. By H. E. Stevens (*U.S.A. Agr. Exp. Stn., Florida, Bull.* 122, March 1914, pp. 112–118; 4 figs.).—A disease which attacks the leaves, shoots, twigs, and fruit of the Citrus, especially the grape fruit. It appears to be

a new disease, differing from Scab, Scaly Bark, and Anthracnose, in the larger size of the spots which are formed on the infected portions. The actual cause of the disease has not yet been determined, but there are reasons to suppose that a species of *Phyllosticta* is concerned in its production.

To control and eradicate the disease, all infected plants should be immediately destroyed. Spraying with Bordeaux mixture is apparently ineffective in checking the spread of the fungus.—*A. B.*

Citrus-root Nematode. By N. A. Cobb (*Jour. Agr. Research*, ii. pp. 217–230, June 1914; figs.).—*Tylenchulus semipenetrans* is a newly discovered eelworm, similar in many ways to the well-known *Heterodera radicicola*. It attacks the roots of Citrus trees in California and elsewhere, which it kills. Attacked roots become somewhat swollen, and the cortex contracts so that it appears more or less as a series of beads along the central tissues of the root. Water at a temperature of 140° is sufficient to kill the eelworm, while it does not injure seriously any but the smallest roots, which are soon replaced when the pest is killed.—*F. J. C.*

Citrus Trees, Diseases. By G. P. D. Smith and E. Mackinnon (*Agr. Gaz. N.S.W.* vol. xxv. pp. 945–954; 4 plates).—The diseases of Citrus trees are for the most part due to fungi, which may be kept in check by rigorously cutting out and burning the diseased wood and fruit, and by spraying as soon as the fruit sets. The following sprays are recommended: Bordeaux mixture, lime sulphur, and ammoniacal copper carbonate. The last is prepared by dissolving 5 oz. of copper carbonate in 3 pints of ammonia (26° Baumé) and diluting with 50 gallons of water. Melanose, due to *Phomopsis Citri*, Brown Spot, due to *Colletotrichum gloeosporioides*, Scab, Wither-tip, and Die-back may all be cured by this treatment. To protect fruit in transit from blue mould, spray the packing cases with formalin (1 : 100) and wrap each fruit in paper. Sooty mould or fumagine does much damage. It is caused by *Capnodium citricolum*, which only thrives on trees infested with scale. Spray with washing soda (3 lb. to 8 gallons of water) or dilute starch (1 lb. to 4 gallons).

Irregular water supply induces to attacks of "Maori," and insufficient shade to Black Spot. Honey fungus (*Armillaria mellea*) attacks the roots of the trees in the form of dark-brown strands, developing into brown toadstools at certain seasons. The foliage is affected. When this is noticed, scrape away the soil from the roots, cut out diseased parts, and dress with Bordeaux paste. Collar Rot is treated in the same way. Stimulate growth by the application of manure. Exanthema is due to poor soil and lack of humus. Chlorosis is recognized by the appearance of white blotches on the leaves. It is due to absence of iron in the soil and too much lime.—*S. E. W.*

Clematis Armandi (*Bot. Mag.* tab. 8587).—China. Nat. Ord. *Ranunculaceae*, tribe *Clematideae*. Shrub, far-climbing. Leaves trifoliate; leaflets ovate-lanceolate, to 4 inches long. Cymes axillary, several-flowered. Flowers 2 inches across. Sepals, 5–7, white.—*G. H.*

Coelogyne brachyptera (*Bot. Mag.* tab. 8582).—Burma. Nat. Ord. *Orchidaceae*, tribe *Epidendreae*. Herb, epiphytic. Leaves elliptic-lanceolate, 5–6 inches long. Flowers showy, greenish-yellow, 2 inches across.—*G. H.*

Collectors, Hints for (*Kew Bull.* 1914, p. 97, May 1914; figs.).—A valuable series of directions for collectors, and transmitting or preserving plants for cultivation or as museum specimens.—*F. J. C.*

Conifers, Notes on. By A. Bruce Jackson (*Gard. Chron.* Jan. 30 to May 15, 1915, pp. 53, 78, 206, 259; 4 figs.).—A continuation of the critical notes begun in the previous year. *Cupressus macrocarpa*, *C. sempervirens*, *C. lusitanica* and its var. *Benthamii* are the trees dealt with.—*E. A. B.*

Cotoneaster Franchetii (*Bot. Mag.* tab. 8571).— Western China. Nat. Ord. *Rosaceae*, tribe *Pomeae*. Shrub, 3–10 feet high. Leaves ovate, ¾ inch long. Inflorescence corymbose. Corolla ¼ inch across, rose-coloured. Fruit orange-red, ⅓ inch long.—*G. H.*

Cottonwood in the Mississippi Valley. By A. W. Williamson (*U.S.A. Dep. Agr., Bull.* 24, December 31, 1913).—The common cottonwood, *Populus deltoides* Marsh., occurs principally along the margins of streams from the Province

of Quebec and the shores of Lake Champlain down the Connecticut River and along the Atlantic coast south to northern Florida; and westward, except in the higher altitudes of the Appalachians, through the Mississippi Valley to the foothills of the Rocky Mountains in New Mexico; and northward into southern Alberta. East of the Appalachians it is very scattering and rare. It follows up the tributaries of the Mississippi River into the Great Plains region, where it is found at altitudes as high as 9,000 feet, but is confined to the river banks.

One serious objection to cottonwood is its rapid decay when exposed to the weather or when in contact with the soil. To make the wood more durable, preservative treatment will in many cases be necessary. Because of its open, porous texture, cottonwood takes preservatives readily, the treatment requiring comparatively small expense.

In the manufacture of shipping cases for food products cottonwood is used in large quantities. When properly seasoned it imparts little, if any, taste or odour to the contained product. For this reason also it is in demand for candy pails and the like. Its toughness and lightness give cottonwood additional fitness for boxes and crates. Experiments by the Forest Service to determine the comparative strength of packing boxes of various woods demonstrated beyond question that, when taken weight for weight, the cottonwood box outclasses in strength similar containers of practically all other species extensively used—such as white pine, yellow pine, spruce, hemlock, and red gum. Bulk for bulk, cottonwood is surpassed only by red gum.—*A. D. W.*

Corn (Zea Mays), Cob Rot of. By E. G. Arzberger (*U.S.A. Agr. Stn., Ohio, Bull.* 265, Nov. 1913, pp. 69–82).—This disease is caused by the fungus *Coniosporium Gecevi*, Bubak. From a series of exhaustive inoculations on growing corn plants, it appears that this fungus is an obligate saprophyte and is only of economic importance in that it destroys the stored cobs; apparently it does not attack the growing plants. Its effects on the grains are small compared with those of *Fusarium*, *Diplodia*, and other fungi.—*A. B.*

Crataegus pubescens, forma **stipulacea** (*Bot. Mag.* tab. 8589).—Mexico. Nat. Ord. *Rosaceae*, tribe *Pomeae*. Tree, 15–35 feet high, sometimes with spines 1½ inch long. Leaves ovate-lanceolate, serrated, 5 inches long. Corymbs, 6–15-flowered, 2 inches across. Flowers white, 1 inch across. Fruits globose, nearly 1 inch across, yellow, with purple spots.—*G. H.*

Cyrtosperma Johnstoni (*Bot. Mag.* tab. 8567).—Solomon Islands. Nat. Ord. *Aroideae*, tribe *Orontieae*. Herb, over 3 feet high. Leaves, triangular-sagittate. Petioles, to 3½ feet long, armed with short hooks. Blade dull purple below. Spathe erect, 6 inches long, margins incurved, outside dark violet, inside dull whitish-green, at the base rosy-purple.—*G. H.*

Cytisus pallidus (*Bot. Mag.* tab. 8578).—Nat. Ord. *Leguminosae*, tribe *Genisteae*. Shrub, 4–10 feet high. Leaves trifoliate. Flowers in 10-flowered cymes, 1 inch from tip of standard to keel yellow.—*G. H.*

Distribution of Plants, The Rôle of Winter Temperatures in Determining. By Forrest Shreve (*Amer. Jour. Bot.* vol. i. April 1914, pp. 194–202; 1 fig.).—The control of plant distribution by the temperature factor is one of the important and most difficult tasks in physiological plant geography. The work of Willdenow, Humboldt, and others in delimiting the great temperature zones of the earth in relation to flora must be mentioned. The dictum that the character of the flora is controlled by temperature, that of its vegetation by moisture, originated from the investigations of these observers.

In considering the influence of the phases of the temperature factor two well-marked groups may be indicated. One deals with those phases which concern the length of the season in which growth and other activities are possible; with the curve of temperature conditions within this season, and the possible effect of the highest portions of the seasonal curve as deterrent to the activities of plants. The second deals with those which have to do with the length of the season during which low temperatures may exert a deterrent or fatal effect upon physiological activities, and with the duration and intensity of the critical periods in this season.

One of the most widely used schemes in the formulation of temperature data, so as to give them general applicability in biogeography, is the system of life zones proposed by Merriam. These are based on the isothermal lines which indicate the totalled degrees of temperature for the growing season. This system,

however, is criticized as a general scheme of classification of biogeography regions. The rôle of soil and atmospheric moisture is of vital importance, and is potent in determining the areas of the principal vegetational regions of the globe.

At the Desert Laboratory, Tucson, Arizona, much useful work has been done in determining the distribution of plants as controlled by the temperature and other factors. The topography of the country renders it of extreme interest and value for investigations of this nature. From the surrounding desert ascend three ranges of mountains, rising to 9,000 feet. The slopes present rapid changes of climate and vegetation from Cacti and thorn-shrubs at the base, through junipers and oaks, to forests of yellow pine and spruce and fir. The lower limit of the juniper-oak chaparral is about 4,500 feet, that of the pine forest about 6,500 feet. Their failure to reach the desert is attributed to the ratio between the soil moisture and the evaporation in the early summer, which is of extreme aridity below 5,000 feet. There is the possibility that some phase of the summer temperature conditions may also operate to limit the distribution of mountain plants at the edge of the desert.

The upward limitation of the subtropical desert species is attributed to the winter phases of the temperature conditions, as has been determined both by experimental evidence and by correlation of the results with observations of the vertical limits of species.—*A. B.*

Drug Plants in England, Collection and Sale of (*Jour. Bd. Agr.* xxi. p. 62, April 1915).—Owing to the shortage of drugs because of the War, the Board of Agriculture suggests that the members of Natural History Societies &c. might usefully co-operate in the collection and sale of drug plants during the present year. Reference is made to the Board's Leaflet 288, which gives information as to the various drug plants, their cultivation and collection. Foxglove, Henbane, Thorn-apple, and Belladonna are the most important species, but many other species are useful. Arrangements should be made previously as to the sale and despatch of plants, and the Board will furnish a list of possible buyers who would supply information as to special requirements. The careful identification of species is emphasized, and the depletion of species in particular localities is deprecated.—*G. C. G.*

Echinocactus minusculus (*Bot. Mag.* tab. 8583).—Argentina. Nat. Ord. *Cactaceae*, tribe *Echinocacteae*. Herb, succulent, globose, 1–2½ inches across, tuberculated. Flowers rising from the base of the plant, erect, 1 inch across. Petals about 12, bright vermilion.—*G. H.*

Echinopanax horridus (*Bot. Mag.* tab. 8572).—Japan and North America. Nat. Ord. *Araliaceae*, tribe *Schefflereae*. Shrub, 3–10 feet high. Leaves palmately 5–9-lobed, 6–10 inches across. Flowers umbellate, arranged in dense globose panicles, pale green.—*G. H.*

Echiums from the Atlantic Islands. By T. A. Sprague and J. Hutchinson (*Kew Bull.* pp. 116-122, 265-267, May, October 1914; plates).—A descriptive account of the Echiums of the Canary Islands and Madeira, in which *Echium giganteum*, *E. leucophaeum*, *E. Bond-Spraguei*, *E. brevirame*, *E. aculeatum*, *E. Auberianum*, *E. Wildpretii*, and *E. Perezii* are dealt with. *E. Bond-Spraguei* and *E. brevirame* are new species.—*F. J. C.*

Electrical Injuries to Trees. By Geo. E. Stone (*U.S.A. Exp. Stn., Mass., Bull.* 156, Oct. 1914, pp. 1–19; 5 plates and 3 figs.).—This bulletin replaces one published in 1902, and details of new observations since that time have been incorporated in the present edition.

In towns, both alternating and direct currents are used. They produce different physiological effects, the alternating current being apparently less injurious than the direct. Both, however, at a certain amperage, act as a stimulus and cause accelerated growth and development. The minimum and optimum current strengths differ little in different plants. The maximum current—that necessary to kill a plant—varies considerably.

The greatest injury, however, consists of local burning and partial destruction of the trees, caused by high-tension line wires. In dry weather little or no leakage from wires occurs, but in wet weather, when a film of water is formed on the bark, more or less leakage occurs, and if the insulation is insufficient, grounding takes place, and burning due to "arcing" results.

The death of the trees occurs when the polarity in the electric tramways has become reversed, *i.e.* when the rail is positive and the feed wire negative.

Burning is greater at the positive electrode than at the negative electrode.

The high resistance of trees serves as a protection from lightning, and is greatly influenced by temperature and moisture. Stahl states that the more thoroughly wet a tree becomes the less susceptible it is to lightning stroke. Thus smooth-barked trees—beech &c.—are considered to be more immune to lightning than rough-barked trees—oak &c.—because they become thoroughly wet during storms. Smooth-barked trees possess a better water-conducting surface, and have a tendency to equalize the electrical tension between the atmosphere and the ground, so that they are rendered less susceptible to lightning.—*A. B.*

Elm-Bark Beetle. By C. Hankins (*Quart. Jour. of Forestry*, vol. ix. No. 1, p. 72; Jan. 1915).—In many of the elm-growing districts, as well as in parks and amongst hedge and isolated timber, effects of these insects are all too apparent. Trees are being attacked more or less, some showing the first effects, while others are fast becoming stag-headed. The latter have a very unsightly appearance, with their almost barkless branches and twigless boughs. There appears little doubt as to how the spread has become so general. In many cases fallen limbs as well as felled or blown timber are allowed to lie for long periods where they fall. Sickly and dying stumps are frequently seen amongst healthy trees. In woods and plantations large arms and blown trees are found rotting where they fell.

Negligent treatment in keeping woods and plantations clear of fallen timber materially assists the breeding of these insects. Wherever possible, windfalls and dying trees should be removed early, otherwise the growing stock may be endangered throughout a wide circuit.—*A. D. W.*

Eremocitrus, A New Genus of Hardy, Drouth-resistant Citrous Fruits from Australia. By W. T. Swingle (*Jour. Agr. Research*, ii. pp. 85-100, May 1914; plates).—The plant on which this new genus is based is *Triphasia glauca* Lindl. (=*Atalantia glauca* Benth.). It is a gray-green shrub with hairy leaves of the centric type, and slender spiny twigs, and otherwise profoundly adapted to a desert climate. It is dormant during winter, and is apparently adapted to resist considerable cold, for it appears to be exposed to a temperature of 5° Fahr. at times in its native habitat. The author believes the plant may be usefully employed in hybridizing with cultivated species of Citrus in order to improve their drought- and cold-resisting powers. It has been grafted or budded successfully on the orange, lemon, grape-fruit, *Citrus australasica*, tabog (*Chaetospermum glutinosa*), and the Indian wood-apple (*Feronia elephantum*).—*F. J. C.*

Explosives in Agriculture. By H. C. Coggins (*Agr. Gaz. N.S.W.* vol. xxv. pp. 857-860, 929-933; 11 figs.).—Gelignite is the most suitable explosive for use in agriculture, *e.g.* subsoiling, making post-holes, clearing land from tree stumps, and preparing the ground for tree-planting. The last two operations are fully explained by means of diagrams.—*S. E. W.*

Fumigation and Spraying. By H. Garman (*U.S.A. Exp. Stn., Kentucky, Bull.* 172; 9 illus.).—A number of formulas are given of fumigating and spraying mixtures to control insect and fungus pests.

Many strengths of cyanide of potassium are given, but the author suggests the following as being best for the purposes named:—

To kill aphides or white fly on tender plants in greenhouses.

0·25 oz. cyanide of potassium	for each 1,000 cubic feet.
0·30 oz. sulphuric acid	
0·75 oz. water.	

For plants that are not tender, double the quantities as above can be safely used.—*C. P. C.*

Fumigation, The Influence of Temperature and Moisture on. By W. J. Schoen (*U.S.A. Exp. Stn., New York, Tech. Bull.* 30; June 1913).—The results of experiments, in cyaniding, for the destruction of the brown-tail moth (*Euproctes chrysorrhoea* Linn.) are set out. Contrary to accepted opinion, high temperatures with a humid atmosphere proved far more destructive than the opposite conditions.

The dose used was 75 grains potassium cyanide to the cubic foot. Temperature not less than 50° nor above 70° F.—*C. P. C.*

Fruit Trees on Houses (*Rev. Hort. Belge*, Nos. 21, 22, 23, 24, Dec. 1913; figs.).—A series of articles on planting and growing fruit-trees against houses. The writer gives information on choosing varieties, on training in all sorts of ingenious ways in order to utilize every inch of available space, and on the general care of the trees.—*M. L. H.*

Fruits, Economic Properties of some Hardy Ornamental. By W. Dallimore (*Kew Bull.* 1914, p. 339).—A variety of uses have been found for various fruits which are passed in review here.—*F. J. C.*

Girdling Fruit Trees with a Zinc Band (*Queensland Agr. Jour.* p. 397; June 1914).—A wire girdle is thought to be better than ringing; it may be left in position for two or three years without injury to the tree. It is simply a means of constricting the stem or branch without running the risk of wounding them; it is employed on trees which have reached the fruit-bearing stage. In vigorous trees there is a surplusage of wood-growth that has to be removed by much labour at pruning time; if the fruit-girdle can be used to lessen this surplusage, without unduly impairing the vigour of the tree, and at the same time promoting fruitfulness, it may turn out to be a valuable device.—*C. H. H.*

Gongora grossa (*Bot. Mag.* tab. 8562).—Ecuador. Nat. Ord. *Orchidaceae*, tribe *Vandaeae*. Epiphyte. Leaves 8–12 inches long. Scapes, pendent, 1½–2 feet long. Flowers 2 inches long. Sepals lanceolate, orange with purple spots. Lip clawed, 5-lobed. "The long, elegant racemes are most attractive, and the plant is striking on account of the large size of its leaves and pseudo-bulbs."—*G. H.*

Hamamelis vernalis (*Bot. Mag.* tab. 8573).—S.-E. United States. Nat. Ord. *Hamamelidaceae*. Shrub, to 6 feet high. Leaves obovate, 2–4 inches long. Flowers in clusters of 3–4. Petals, 4 yellow, ½ inch long and wavy.—*G. H.*

Indigofera Kirilowi (*Bot. Mag.* tab. 8580).—N. China. Nat. Ord. *Leguminosae*, tribe *Galegeae*. Shrub. Leaves 7–9 foliolate. Flowers in racemes 6 inches long, 1 inch from tip of standard to keel, rose-coloured, with purple spots at base of standard.—*G. H.*

Iris Wattii. By W. R. Dykes (*Gard. Chron.* Feb. 20, 1915, p. 95).—Seeds from Yunnanfu, in S.-W. China, produced an Iris nearly resembling *I. japonica*, but differing in its habit of producing a tall stem in the previous year to that in which it flowers. This plant is here declared to be identical with *I. Wattii* Baker.—*E. A. B.*

Irises, Mr. Farrer's Chinese. By W. R. Dykes (*Gard. Chron.* April 3, 1915, pp. 175–6).—Deals with five Irises, one of which is a new species and is described fully, with Latin diagnosis, as *I. Farreri*. The others are recognized as *I. ensata*, *I. Henryi*, *I. ruthenica*, and *I. goniocarpa*.—*E. A. B.*

Ixora umbellata (*Bot. Mag.* tab. 8577).—Java. Nat. Ord. *Rubiaceae*, tribe *Ixoreae*. Shrub. Leaves elliptic, 6–10 inches long. Flowers white, in corymbs, 6 inches across; corolla ¾ inch across.—*G. H.*

Kolkwitzia amabilis (*Bot. Mag.* tab. 8563).—China. Nat. Ord. *Caprifoliaceae*, tribe *Caprifolieae*. A freely-branching shrub. Leaves, ovate, 1½ inch long. Inflorescence, a dense sub-globular corymb, 2 inches across. Corolla, ½ inch long, white, flushed with rose-pink.—*G. H.*

Larch killed by Longicorn Beetle. By B. B. Osmaston (*Jour. Bd. Agr.* xxi. pp. 1123–1125; March 1915).—An account of the destruction of larches in the pole stage by the longicorn beetle *Tetropium gabrieli* var. *crawshayi*. Woodpeckers are regarded as the most effective ally in the suppression of this beetle. (See *Journal R.H.S.* xl. p. 626.)—*F. J. C.*

Larch-shoot Moths (*Jour. Bd. Agr.* xxii. p. 50, April 1915; 2 figs.).—*Argyresthia atmoriella* is the common species in England, two Continental forms being mentioned as being similar if not the same species. The former is widely distributed and under certain conditions is capable of causing serious loss. The various stages in the life-history of the moth are described and illustrated, as is the damage done. The moths appear about the end of May, laying the eggs on young shoots. The newly-hatched larva bores into the shoots and feeds just under the skin. Little damage is done at first, owing to its small size, but by the end of the following March it has devoured tissues down to the wood, almost completely ringing the shoot. By May it is full fed, and, after biting a hole in the bark through which the moth will escape, it pupates.

Only plants of the genus *Larix* are attacked, the twigs dying owing to the partial ringing. The absence of needles on lateral branches and the presence of burrows and flight-holes are characteristic. It is chiefly destructive where the soil is not altogether suitable for Larch. Removal of affected trees is suggested where only a few trees are attacked.—*G. C. G.*

Larix olgensis—sp. n. By A. Henry (*Gard. Chron.* Feb. 27, 1915, p. 109; 2 figs.).—Diagnosis and description of a Larch from Eastern Siberia, likely to thrive high up in mountain districts of this country.—*E. A. B.*

Legume Inoculation. By Martin J. Prucha (*U.S.A. Exp. Stn., Cornell, Cir.* 15; March 1913).—The author demonstrates the value of pure cultures for inoculating the land, when growing a new type of legume, *e.g.* cowpea, in a particular district.

Some attempts at cross inoculating by nodules from clovers to grow cowpeas failed in practice.—*C. P. C.*

Lilies in 1914. By A. Grove (*Gard. Chron.* Jan. 9, 1915, pp. 13–15; 3 figs.).—Interesting notes on newer species and hybrids, with figures of *L. Bolanderi, L. pardalinum* × *Parryi*, and the bulb of *L. Martagon* × *medeoloides*, showing the intermediate character of the bulb scales.—*E. A. B.*

Lime Magnesia Ratio as Influenced by Concentration. By P. L. Gile. (*U.S.A. Exp. Stn., Porto Rico, Bull.* 12; 4 illus.).—The ratio of lime to magnesia is shown to be of not so great an importance, as far as the rice crop is concerned, as the balancing of lime and magnesia with all the other nutrient salts, or it may explained that the toxicity of an excess of lime or magnesia is not due so much to an unfavourable ratio between these two salts as to an unfavourable proportion between the particular salt in excess and all the others present; hence the mere addition of lime in a soil containing an excess of magnesia would not of necessity check the latter's toxicity, but the bringing up of all the salts relatively to the one in excess would materially help.—*C. P. C.*

Lime Requirements of Certain Soils. By H. B. Hutchinson and K. MacLennan (*Jour. Agr. Sci.* vol. vii. part 1, pp. 75–105, March 1915; pl. and figs.).—The addition of calcium carbonate (*i.e.* chalk, limestone, marl, &c.) merely corrects the soil reaction. Calcium oxide (quicklime or caustic lime) not only does this, but in addition, if applied in sufficient amount, produces certain effects classed under the head of partial sterilization. Failure to recognize this double effect of caustic lime has led in the past to a misinterpretation of experimental results.

In order to determine the right amount of quicklime to apply to the five different soils which were subjected to examination, definite weights of soil were taken and, after being moistened, were treated with different amounts of quicklime ranging from ·1 to 2·0 per cent. of the weight of air-dried soil. At a certain critical point, different for the different soils, the soil was found to be distinctly alkaline, and from 5 to 10 c.c.s of decinormal acid were required to neutralize the whole filtrate. The different amounts of quicklime required to reach this critical point ranged from ·3 to 1 per cent. of the soil taken, and it was further found that the critical point also marked the following :—(i.) inhibition of nitrification, (ii.) destruction of the larger protozoa, (iii.) maximum growth of plants subjected to pot experiments, (iv.) flocculation point. For the soils examined, therefore, the above range of dressings (which correspond to a range of 3 tons to 9 tons to the acre) are the heaviest which should be applied.

To determine whether a soil is acid and therefore requires a dressing of lime it is not sufficient to determine whether or not the soil contains carbonate of lime, since a number of normal soils have been recorded which are neutral and yet contain no carbonate of lime. The authors review the numerous methods which have been adopted by different investigators for the determination of soil acidity, and reject them all as being inferior to the calcium bicarbonate method which they have devised. By treating an excess of carbonate of lime suspended in water with carbon dioxide generated by means of "sparklets" or otherwise a solution of the bicarbonate is obtained which after filtration can be diluted to approximately $\frac{N}{50}$ strength. A known weight of the soil to be examined is shaken for three hours with this solution, and at the end of the period the amount of unabsorbed alkali is determined by standard acid solution in the usual manner. Soils showing a positive lime requirement by this method have been found to respond distinctly to the application of carbonate of lime by increased ammonia and nitrate production in laboratory experiments, and by greater plant growth in pot culture and field work.—*J. E. W. E. H.*

Loblolly Pine in Delaware, Maryland, and Virginia, Forest Management of. By W. D. Sterrett (*U.S.A. Dep. Agr., Bull.* 11; January 23, 1914).—Loblolly pine is easily the leading tree for forest management in those portions

of Maryland, Delaware, and Virginia where it grows naturally. The factors which combine to make it particularly suitable for commercial timber-growing are: The ease with which it reproduces itself and forms pure, well-stocked stands; its rapid growth and the wide range of sites on which it will grow; the many uses to which its wood is adapted; the comparative cheapness of logging and milling the timber, and the good prices which its lumber commands.

Loblolly pine is not fastidious in its soil requirements, and grows on a great variety of sites. It is in fact adapted to a wider range of soil conditions than any of the pines with which it is associated, though it grows best on deep, moist, well-drained, porous soils.—*A. D. W.*

Lonicera fragrantissima (*Bot. Mag.* tab. 8585).—China. Nat. Ord. *Caprifoliaceae*, tribe *Lonicereae*. Shrub. Leaves elliptic, to 3 inches long. Flowers white, geminate. Corolla 2-labiate, ¾ inch from top to base.—*G. H.*

Meconopsis rudis (*Bot. Mag.* tab. 8568).—Western China. Nat. Ord. *Papaveraceae*, tribe *Eupapavereae*. Annual herb. Stem to 3 feet high. Leaves rosulate. Blade 3–5½ inches long. Flowers in racemose cymes, 3 inches across. Petals 6–8, bright blue, flushed with purple.—*G. H.*

Moss, The Eradication of. By R. G. Stapledon (*Jour. Bd. Agr.* xxi. pp. 812–816; Dec. 1914).—Reports some experiments on manuring pastures, and shows that superphosphate in the cases quoted had a marked effect in reducing moss. As is pointed out, however, many mosses, not all of which want the same conditions, grow in pastures, and these may require different treatments. Further study is therefore necessary.—*F. J. C.*

Mycorrhizas of Forest Trees. By W. B. McDougall (*Amer. Jour. Bot.* vol. i. Feb. 1914, pp. 51–74; 4 plates).—This paper begins with a brief review of work of previous investigators, then follow the species of trees studied and the methods of experiments, terminating with a list of references to the literature of this subject. The list of trees whose mycorrhizas were studied included *Carya ovata* (Mill.) K. Koch, *Quercus alba* L., *Tilia americana* L., *Betula alba* var. *papyrifera* (Marsh) Spach.—with ectotropic mycorrhizas; *Acer saccharinum* L. and *A. rubrum* L., with endotropic mycorrhizas. For comparison *Larix*, *Populus*, *Fagus*, *Carpinus*, and *Ostrya* were examined and found to have ectotropic mycorrhizas, while *Juglans*, *Crataegus*, *Aesculus* bore endotropic mycorrhizas. None was found on *Cornus*, *Ulmus*, *Salix*, and *Sassafras*.

The ectotropic mycorrhizas are readily recognized by the clusters of short branches resembling coral branching rootlets. They vary in colour from white to bright yellow, red, or dark brown. On the other hand, the endotropic mycorrhizas are easily distinguished from the normal roots by their beaded appearance.

From an exhaustive investigation, the author concludes that the ectotropic mycorrhizas of forest trees are not in any sense symbiotic associations, but are instances of parasitism of fungi on the roots of the trees; while the endotropic mycorrhizas are sometimes symbiotic associations, and sometimes associations in which the fungus is an internal parasite on the roots. Both types of mycorrhizas are annual, being formed during the summer, reach their fullest development in the autumn, live through the winter, and die in the spring.

As soon as a mantle of mycelium is formed over a root, any further growth of the root in length is inhibited. Thus the root is stimulated to form branches, which in turn become infected and so produce a coral-like cluster of branches.

The mycelium of the ectotropic mycorrhizas belonged to *Russula* sp. on *Tilia americana*; *Boletus scaber* var. *fuscus* on *Betula alba* var. *papyrifera*; *Cortinarius* sp. on *Betula alba* var. *papyrifera*; and *Scleroderma vulgare* on *Quercus alba*.

Four or more different species of fungi may form mycorrhizas on the same tree.—*A. B.*

Narra Fruit, The. By W. Vessfeld, B.A., B.Sc. (*Agr. Jour. Cape G.H.* vol. vii. No. 4, April 1914; pp. 520–522). Further report on analyses of Walfish Bay soils.—This report was the result of investigations undertaken for the purpose of ascertaining the possibility of cultivating the Narra bush in desert countries other than Walfish Bay territory. The results obtained do not conclusively show in which type of soil the Narra will or will not grow. In the Narra bush we have an exceptional plant, and in the locality where it grows an exceptional soil. The plant has the power of growing rapidly through any sand which may cover it, being unhampered by leaves. In addition its

roots go to an enormous depth in search of necessary moisture. The analyses show that there are other localities where the soil would be suitable if injurious salts were absent. "I feel convinced that the Narra will prove impossible of cultivation in any desert regions unless two conditions are fulfilled—namely, a practical permanent supply of water below the surface, and the presence of a larger amount of plant foods in the soil than is usually contained in wind-blown sand."—*A. A. K.*

Nitrogen, Relation of Bacterial Transformations to Soil. By K. F. Kellerman and R. C. Wright (*Jour. Agr. Research*, ii. pp. 101-114, May 1914; figs.).—The malnutrition of oranges, and allied fruits in irrigated areas is attributed to the presence of excessive quantities of nitrates, and the suggested remedy is the control of the rate of nitrification. The addition of mature straw and pure cellulose causes rapid denitrification, owing to the demand for nitrates by the decomposition fungi and bacteria, while the digging in of green crops, though it results in a slight loss of nitrogen, maintains the normal rate of nitrification. Tables are given showing the quantities of nitrates in the soil under various conditions, and also that the total number of bacteria in good and poor areas is erratic and seems without significance.—*F. J. C.*

Nothofagus Cunninghamii (*Bot. Mag.* tab. 8584).—Australia, Tasmania. Tree, to 200 feet, with a girth of 40 feet, in lower mountain slopes; near summit a dwarf shrub. Leaves evergreen, ⅛–⅜ inch long, crenate.—*G. H.*

Onions, and Yield per Acre (*Queensland Agr. Jour.* p. 6; Jan. 1914).—The following yields were obtained from plots of one square chain (one-tenth of an acre) from seed sown in boxes in February and transplanted 12 inches by 3 inches in April:—The varieties of onion were "Ironhead," yielding from the acre 11·7 tons, "Cream Globe" 12·8 tons, "Wroxton" 17·6 tons, "Ailsa Craig" 22·1 tons.—*C. H. H.*

Pear, 'LeConte': An Inquiry into the Nature of a Somatic Segregation of Characters in. By Warren P. Tufts (*Oregon Agr. Coll. Exp. Stn., Bull.* 123, Dec. 1914; 5 figs.). In this pear, supposed a hybrid between varieties of *Pyrus sinensis* and *P. communis*, the calyx lobes are sometimes persistent, but often not so. The author attributes this to a somatic segregation of Mendelian characters, and by treating each carpel as a unit produces figures which are not very remote from the Mendelian expectation. As, however, no evidence is offered of these characters breeding true in either parent, other explanations of this phenomenon will readily occur to students of these subjects. The paper, we learn, was presented in part fulfilment of the requirements for a Master's degree in Agriculture.—*E. A. Bd.*

Peat, Its Use in Planting Fruit Trees. By A. Truelle (*Rev. Hort. Belge*, April 1914, p. 131).—The uses of peat for fruit trees have not hitherto been sufficiently recognized. It helps to make a firm, cool soil about the roots, and converts added moisture into an immediately assimilable liquid manure. Peat varies greatly, of course, in character. The form most suitable for the present purpose is the mossy or fibrous kind which forms the top layer of bogs. It should be light in colour, porous, poor in mineral matter, and above all not sour.
M. L. H.

Pestalozzia funerea, A Contribution to the Morphology and Life History of. By J. J. Wenner (*Phytopathology*, iv. pp. 375-383; Oct. 1914; figs.).—Doubt is sometimes expressed as to the parasitism of this fungus, which occurs on a variety of coniferous trees. The author finds it is parasitic, especially when the air is very moist. It is capable of attacking both leaves and stems of *Pinus Strobus*, *Picea excelsa*, and *Tsuga canadensis*, the hosts experimented with. The leaves are browned, followed by the drooping of the young shoots, on which the fungus fruit develops. The shoots finally die and eventually the whole plant is killed. The author discovered a second form of spore in addition to the ordinary conidia. He advises that diseased seedlings should be destroyed as soon as detected, and that spraying with Bordeaux mixture should be carried out.—*F. J. C.*

Phosphate Fields of South Carolina, A Report on. By W. H. Waggeman (*U.S.A. Dep. Agr., Bur. Soils, Cir.* 18, October 1913; 1 map).—A description of the phosphate deposits of South Carolina, methods and costs of working, with an outline of the probable future of the industry.—*C. P. C.*

Phosphorus in Flat Turnips, as Influenced by Amount available in Soils, The Percentage of Total. By Burt L. Hartwell (*U.S.A. Exp. Stn., Rhode I., Bull.* 154, April 1913).—The addition of phosphates to various soils increased the amount of phosphorus in turnips, the quantity depending upon the type of manure given.

It is suggested that a good practical way of ascertaining the amount of available phosphorus in the land would be to grow a crop of turnips and estimate therefrom.—*C. P. C.*

Pimelea ferruginea (*Bot. Mag.* tab. 8574).—W. Australia. Nat. Ord. *Thymelaceae*, tribe *Euthymelaceae*. Shrub, to 2 feet high. Leaves opposite, under ½ inch long. Heads terminal, globose, many-flowered, 1½ inch across. Perianth rose-coloured.—*G. H.*

Pitwood Trade in the Midlands. By A. Slater (*Quart. Jour. of Forestry*, vol. ix. No. 2, pp. 134–137; April 1915).—Early in September foreign pit-wood was quoted at 35*s.* the ton ex boat, Cardiff, and in less than two months fluctuated down to 19*s.* 6*d.*, and again has steadily risen, and at the time of writing these notes (end of February) it has reached the high price of 37*s.* the ton. Yet at this high figure I doubt whether anyone disposing of home-grown pitwood can realize anything like the same net return as could be obtained last September. If anyone were to be blamed for the sudden rise in prices for native pit timber, it should be laid on the shoulders of the pit-owners themselves; and the public remark made by the chairman of a well-known colliery company, stating that the supply of native timber suitable for pit-wood would only last a few months, no doubt, was seriously taken by the general public and even colliery-owners.

There are at the present time, I think, two reasons affecting the sale of home-grown pit-wood: first, the timber is often situated a considerable distance from a railway station, and the haulage to it is not only an exceedingly expensive item, but it is very difficult even to get hauliers who can undertake to find horses and men; secondly, the heavy carriage imposed by railway companies for the carriage of home-grown pit-wood.—*A. D. W.*

Plant Diseases in Connecticut. By G. P. Clinton, Sc.D. (*U.S.A. Agr. Exp. Stn., New Haven, Conn.*, July 1914, pp. 1–42; 8 plates).—This gives details of the various plant diseases which have been investigated in Connecticut during 1913. Amongst the bacterial diseases of plants are the Heart Rot of Celery, the Soft Rot of the Parsnip and the Salsify (*Bacillus carotovorus* Jones), the Black Leg of the Potato (*Bacillus phytophthorus* Appel), which was formerly confused with *Bacillus Solanacearum*; and Crown Gall on the Spindle Tree (*Bacterium tumefaciens* Sm. and Towns.). This last is a new host for *B. tumefaciens*, which has been previously reported on the apple, blackberry, plum, peach, raspberry, rose, white poplar, and wistaria.—*A. B.*

Plant Pathology, Problems and Progress in. By L. R. Jones (*Amer. Jour. Bot.* vol. i. March 1914, pp. 97–111).—A stimulating and inspiring address by the retiring President of the Botanical Society of America, dealing with the problem of parasitism; the life-history problems; the culture problem; bacteria in relation to plant disease; the relation of parasite to host and environment; the non-parasitic disease; and the problems of disease control.

The Problem of Parasitism.—Our knowledge owes much to De Bary, who demonstrated the true relation between fungus and the host plant, but we have scarcely begun the study of the intimate relations of parasite and host, the conditions and the results of parasitism.

The Life-history Problems.—Attention was drawn to the classical examples. Kühn's work on grain infection by smut; De Bary's work on the life-histories of the Peronosporales and the heteroecism of the rusts. Discoveries as to the life-histories of parasites are of more practical importance for disease control than demonstrations with spray mixtures; the last are transient, the first are permanent contributions.

The Culture Problem.—The monumental work of Pasteur in the cultivations of yeasts and bacteria, and the rise of the science of bacteriology and pure cultures, were referred to. The value of solid over liquid media is increasingly established. The process of inoculation has not yet been fully realized in plant pathology. It is only thus that we can learn of the species susceptibility of hosts and the occurrence of biological forms amongst parasites—both of paramount importance, economically and scientifically, in plant pathology.

Bacteria in Relation to Plant Disease.—The early work of Burrill and the recent work of E. F. Smith were especially dealt with.

The relations of Parasite to Host and Environment.—One cannot fully understand the diseases of the potato except as he understands them in relation not only to the normal physiology and morphology of the plant, but in relation to its history and its variations under culture. The pathologist of the past has been a mycologist and a bacteriologist; the pathologist of the future must be a physiologist; for what is pathology but abnormal physiology?

The Problems of Disease Control.—Spraying and seed treatment are only a part of sanitation. Full data as to the life-histories and dissemination of causal organisms are more important fundamentals. There is also the question of disease resistance and immunity, which is of great importance.

In conclusion, the demand upon a phytopathologist is equally urgent for four types of service: (*a*) College teaching; (*b*) extension teaching; (*c*) inspection; (*d*) research. These lines must be realized if the best results are to be secured.
A. B.

Pleione pogonioides (*Bot. Mag.* tab. 8588).—China. Nat. Ord. *Orchidaceae*, tribe *Epidendreae*. Herb, terrestrial, 3–4 inches high. Leaves 2–6½ inches long. Flower terminal, showy, rosy red, 2 inches long.—*G. H.*

Potash Salts, Alunite and Kelp as. By J. J. Skinner and A. M. Jackson (*U.S.A. Exp. Stn., Dep. Agr., Bur. Soils, Cir.* 76; April 1913).—Alunite, described as a double sulphate of potash and aluminium, when ignited, gave rather better results than potassium sulphate. On the other hand, raw ground alunite was not so effective as the latter.

Kelp, in comparison with potassium chloride, gave equal results in crop, with better growth. The authors therefore recommend alunite and kelp as satisfactory substitutes for the sulphate and chloride of potassium salts.—*C. P. C.*

Potato Blight in India. By J. F. Dastur (*Mem. Dep. Agr. India, Bot. Ser.* vii. 3, Apr. 1915; plate).—Potato blight (which is also called by the author "leaf curl") due to *Phytophthora infestans* broke out in the plains in 1912–13. It is thought to have been introduced by "seed" from the hills obtained late in the season. Tubers from diseased plants kept in sand produced healthy crops in the succeeding year, whether in fresh or in the old soil. The fungus in pure culture died out in the hot season. The author considered the high temperature to which the tubers were exposed during the hot season killed the fungus, and believes there is no fear of its spread if tubers for seed are allowed to pass part of the summer in the plains.—*F. J. C.*

Potato Scab. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxv. pp. 869–872).—The term Potato Scab is applied to a roughening of the skin of the potato, which may be due to widely different causes: (1) abrasion produced by wire-worms, millipedes, cut worms or eelworms; (2) the action of fungi. *Oospora scabies* covers the surface of the tuber with mycelium. *Rhizoctonia Solani* causes Black Speck Scab; the potato is covered with black specks. The threads of the fungus may penetrate the tuber and cause it to rot. Potato Dry Scab is due to *Spondylocladium atrovirens*. The tuber is covered with white or violet blotches, sprinkled with black spots. *Spongospora subterranea* causes corky or powdery scab. Black Wart disease is due to *Synchytrium endobioticum*. Some protection against scab is secured by immersing the seed potato in dilute formalin (1 : 500) for two hours.—*S. E. W.*

Potato Wart Disease, Experiments in Preventing. Anon. (*Jour. Bd. Agr.* xxi. pp. 1126–1128; March 1915).—Treatment with commercial formaldehyde and water (1 to 100), formalin (1 to 100), mercuric chloride (·1 per cent.), sulphate of potash (10 cwt. to acre), kainit, and salt, in various localities in England, failed entirely to check the wart disease. 'Epicure,' 'Up-to-date,' 'King Edward VII.,' 'Duke of York' were the varieties grown. 'Iron Duke,' a selected form of 'President,' proved very susceptible to attack.—*F. J. C.*

Potatos, Cheap Compound v. Home-mixed Manures for. By R. N. Dowling (*Lindsey C.C., Bull.* 3, 1914–15).—A comparison was made between the values of home-mixed manures containing (1) sulphate of ammonia 1 cwt., sulphate of potash 1 cwt., superphosphate 4 cwt. (cost £1 3*s.*); (2) sulphate of ammonia 1 cwt., superphosphate 4 cwt. (cost £1 3*s.*); (3) nitrate of soda 1½ cwt., sulphate of potash 1 cwt., superphosphate 4 cwt. (cost £1 15*s.*), and (4) three compounded manures at the cost relative to the area covered of £1 19*s.*, £1 19*s.* 6*d.*, and £2 0*s.* 6*d.* The three plots dressed with the home-

mixed manures gave by far the largest yields in the order named, the highest of those dressed with a compound manure being 7 tons 1 cwt. to the acre, the lowest of those dressed with home-mixed manure being 8 tons, the highest 8 tons 10 cwt. 3 qrs. to the acre.—*F. J. C.*

Prickly Pears of Australia. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxv. pp. 883–4; 1 photo, 1 col. plate).—*Opuntia cochinellifera*, the cochineal cactus, is the best to grow in Australia. It may be used as food for pigs, but has not a high nutritive value. The high percentage of fibre it contains renders it a doubtful food for herbivora.—*S. E. W.*

Primula vinciflora (*Bot. Mag.* tab. 8564).—South-Western China. Nat. Ord. *Primulaceae*, tribe *Primuleae*. Herb, perennial. Leaves 3½ inches long. Scape 1-flowered. Corolla violet, 2 inches across, with purple centre.—*G. H.*

Primula vittata (*Bot. Mag.* tab. 8586).—Szechuan. Nat. Ord. *Primulaceae*, tribe *Primuleae*. Herb, perennial. Leaves oblanceolate, 6 inches long. Scape 7-8 inches high, white-floury above, 6–16-flowered. Corolla ¾ inch across, purple.—*G. H.*

Primulas, New Chinese. By I. B. Balfour (*Gard. Chron.* Ap. 17, 1915, p. 207; 3 figs.).—*Primula brevifolia*, *P. gracilenta*, and *P. florida*, which this year have flowered for the first time in cultivation at Edinburgh, are figured from photographs of the living plant.—*E. A. B.*

Prunus microlepis var. **Smithii** Koehne. By W. J. Bean (*Kew Bull.* No. 2, p. 51).—This plant has been in cultivation under the name *Prunus Miqueliana* for some years (see JOURNAL R.H.S. pp. xxxviii., ccxxxviii, cclviii, cclx), and is remarkable for flowering in November. It has semi-double, pale pink flowers, and was introduced from Japan by Mr. T. Smith of Newry, after whom it is named.—*F. J. C.*

Raspberry or Clay-coloured Weevil. By J. C. F. Fryer (*Jour. Bd. Agr.* xxi. pp. 832–835; Dec. 1914).—This weevil (*Otiorhynchus picipes*), the 'clay-coloured,' 'red-footed,' or 'raspberry' weevil, is frequently very destructive to nursery stock. An account of a particular attack is given in which pears and black currants suffered severely. First the leaves only, then the buds, ends of twigs, and bark of younger branches were eaten by the beetles. The attack began in April and continued to July 1914. The older portions of the orchard escaped attack. The severity of the attack varied among the individual trees of one variety (*e.g.* 'Conference' Pear) to a remarkable extent. The orchard had not been kept clean, and the larvæ had probably fed upon the roots of the weeds. Lead arseniate spraying proved ineffective as a means of destroying the beetles, and hand picking had to be resorted to.—*F. J. C.*

Rhododendron fastigiatum. By W. J. Bean (*Kew Bull.* No. 2, p. 51, 1914).—A dwarf pale purple rhododendron from W. China, collected by G. Forrest.—*F. J. C.*

Rhododendrons, New. By W. J. Bean (*Kew Bull.* 1914, p. 201; plate).—Notes on the characteristics of *Rhododendron auriculatum*, *R. crassum*, *R. Hanceanum*, *R. longistylum*, *R. lutescens*, *R. moupinense*, *R. quinquefolium*, *R. rotundifolium*, *R. Souliei*, and *R. Williamsianum* are given, *R. Hanceanum* and *R. moupinense* being figured.—*F. J. C.*

Rhododendrons, New. By W. J. Bean (*Kew Bull.* 1914, p. 382).—*Rhododendron adenopodum*, *R. argyrophyllum*, *R. calophytum*, *R. Davidii*, *R. discolor*, *R. Faberi*, *R. longesquamatum*, *R. pachytrichum*, *R. Przewalskii*, *R. strigillosum* are described. They are all new Chinese species.—*F. J. C.*

Ribes × wollense. By W. J. Bean (*Kew Bull.* No. 2, p. 49, 1914; plate).—Describes a new hybrid between the black currant and the gooseberry from a very old plant. It approaches the gooseberry in foliage and flower, has black fruits in racemes with a suggestion of black currant in flavour. It is said to be distinct from *R.* × *Culverwelli* and *R.* × *Schneideri*, both reputed gooseberry-black-currant hybrids.—*F. J. C.*

Rosa corymbulosa (*Bot. Mag.* tab. 8566).—China. Nat. Ord. *Rosaceae*, tribe *Roseae*. Shrub, erect or scandent, 3–6 feet high. Flowers 1 inch diameter. Petals rose-coloured, with white base. Fruit globose.—*G. H.*

Rosa setipoda (*Bot. Mag.* tab. 8569).—China. Nat. Ord. *Rosaceae*, tribe *Roseae*. Shrub, 6–10 feet high. Flowers showy, 2 inches across. Petals wide, pale rose, with a whitish base.—*G. H.*

Roses, Hybrid Austrian Briars. By G. M. Taylor (*Gard. Chron.* Jan. 23, 1915, p. 37).—Two Continental raisers obtained hybrids in the closing years of last century, viz. M. Pernet-Ducher and Dr. Müller. Descriptions are given of 15 later varieties of Austrian Briar parentage.—*E. A. B.*

Rubus Giraldianus. By W. J. Bean (*Kew Bull.* 1914, p. 52; plate).—A fine white-stemmed blackberry with graceful arching stems. (See JOURNAL R.H.S. xl. p. 217.)—*F. J. C.*

Rust of Oak and Pine. By G. G. Hedgcock and W. H. Long (*Jour. Agr. Research*, ii. pp. 247-249; figs.).—The authors have compared the fungus hitherto known as *Cronartium Quercus* in America with the European species of that name, and conclude it to be different, proposing the new combination *C. cerebrum* for it. Infection of various species of Pinus with it shows that its effects on different hosts are not all alike. On *Pinus contorta*, *P. edulis*, *P. densiflora*, *P. divaricata*, and *P. virginiana* spheroid swellings are generally produced; on *P. Coulteri*, *P. ponderosa*, *P. radiata*, and *P. Sabiniana* fusiform swellings (which, with other facts, suggests that *Peridermium fusiforme* may be identical with this). In nature spheroid galls are usually found on *P. divaricata*, *P. clausa*, *P. echinata*, *P. glabra*, *P. resinosa*, and *P. virginiana*, and the fusiform on *P. serotina* and *P. Taeda*. On *P. Taeda* the galls are often accompanied by witches' brooms. The uredospores were produced on *Quercus nigra*, *Q. velutina*, *Q. californica*, *Q. digitata*, *Q. Gambelii*, *Q. imbricaria*, *Q. lobata*, *Q. Michauxii*, *Q. Phellos*, *Q. rubra*, *Q. alba*, *Q. bicolor*, *Q. Emoryi*, and *Castanopsis chrysophylla*. (See also JOURNAL R.H.S. xl. p. 619.)—*F. J. C.*

Saltpetre for Destroying Trees (*Queensland Agr. Jour.* p. 72; Jan. 1914).—Where it is desired to destroy a tree without cutting it down, a hole is bored in the tree in a downward direction to the centre. For large trees, a 1 inch auger is used; for smaller ones, ½ inch size is large enough. For large trees, 1 oz. to 2 oz. of ordinary commercial saltpetre (nitrate of potash) is used, and for smaller ones ½ oz. to 1 oz. A plug is put in the hole to keep rain from washing it out. The nitrate of potash is carried by the sap to the tips of the branches and to the rootlets. If the tree is a large one, say 2 feet or more in diameter, very little difference will be noticed in the foliage for two or three months, then the leaves begin to fall, and it assumes a bare, wintry appearance. At the end of about six or eight months a little brushwood is piled round the tree and lit; it will smoulder away to the remote ends of the roots, sometimes 30 feet from the butt of the tree, leaving masses of valuable ash; the tree will fall, and when fallen it will continue to smoulder until every particle is converted into ash. —*C. H. H.*

Salvia longistyla (*Bot. Mag.* tab. 8590).—Mexico. Nat. Ord. *Labiatae*, tribe *Monardeae*. Herb, up to 15 feet in height. Leaves 3–5½ inches long. Raceme often 15 inches up to 25 inches long. Flowers with corollas 1½ inch long, scarlet.—*G. H.*

Sand Dunes at Culbin, The Planting of. By P. Leslie, M.A., B.Sc. (*Trans. Roy. Scot. Arbor. Soc.* vol. xxix. pt. 1, pp. 19–28; January 1915).—One of the most striking illustrations that we possess in this country of lands, otherwise useless, being reclaimed and made of economic value by means of afforestation, is afforded by the experiments which have been carried out during the last hundred years on the large stretches of sand known as the Maviston and Culbin Sands, situated on the Morayshire and Nairnshire coasts, between the rivers Nairn and Findhorn.

The Culbin Sands proper cover an area four miles long by two miles broad. Towards the north they are covered with sand piled up into ranges of hills and valleys in seemingly endless succession. From the top of these hills, which often exceed 200 feet in height, an excellent view is obtained of the surrounding country, and of the far distant hills of Cromarty. In the valleys the old land surface often comes to view. The furrows made by the plough two hundred years ago are still visible.

As these sand-hills are, to begin with, quite bare of any covering, it is specially necessary to see that the sand is properly fixed before carrying out any planting. First of all, the sands for some distance to the west of where it is proposed to plant are fixed with marram grass. The grass is transplanted from places where it is growing thickly. As it possesses great vitality, much care need not be taken in the operation. It is simply inserted in holes made in the sand, when it quickly produces long runners and spreads rapidly. In the area where the planting is to take place, spruce branches are laid down with their ends inserted in the sand on the windward side.

The cost of planting is not high :—

	s.	d.
Cost of labour an acre	10	0
Cost of carting brushwood, 4 loads an acre	4	0
Plants, 4s. 6d. a thousand	13	0
Total	27	0

Or, say, 30s. an acre exclusive of fencing.—*A. D. W.*

Scale Insects of New South Wales. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxv. pp. 875–882, 983–989 ; 7 figs.).—A descriptive list of Scale Insects attacking plants in New South Wales.—*S. E. W.*

Schizandra Henryi. By W. J. Bean (*Kew Bull.* 1914, p. 52).—A deciduous climbing shrub introduced from China through E. H. Wilson, with white flowers and coriaceous shiny leaves.—*F. J. C.*

Seeds, Maximum Age of Germination (*Queensland Agr. Jour.* p. 235; April 1914).—Ralph L. Watts, Professor of Horticulture in the Pennsylvanian State College, gives :—Artichoke 2 years, Asparagus 2, Beans 3, Beet 4, Cabbage 3, Carrot 1, Cauliflower 4, Celery 2, Cucumber 5, Egg Plant 5, Endive 2, Kale 2, Kohlrabi 3, Leek 3, Lettuce 4, Muskmelon 5, Okra 4, Onion 1, Parsley 1, Parsnip 1, Pea 3, Pepper 3, Radish 2, Salsify 2, Squash 3, Tomato 5, Turnip 4, Watermelon 5.

He gives as the average percentages of germination of one-year-old seed :— Asparagus 90, Bean 90, Beet 140 (botanically a fruit, often containing more than one seed), Cabbage 90, Carrot 80, Cauliflower 80, Celery 60, Maize 85, Cucumber 85, Egg Plant 75, Lettuce 85, Muskmelon 85, Okra 80, Onion 80, Parsley 70, Parsnip 70, Pea 90, Radish 90, Salsify 75, Spinach 80, Squash 85, Tomato 85, Watermelon 85. —*C. H. H.*

Shrubs in Winter, Care of. By Henri Chevalier (*Rev. Hort. Belge*, No. 3, Feb. 15, 1914, p. 53).—An important part of management of flowering shrubs is the pruning. The time and the manner of this pruning vary with the habit of each plant. Lilacs, Deutzias, Forsythias, and Diervillas, which flower on the wood of the year before, should, if possible, be pruned as soon as they have done flowering, at the end of June. Roses, *Hydrangea paniculata, Ceanothus, Desmodium*, &c., which flower on the current year's wood, should be pruned either in winter or spring. Some trees require hard pruning, others only enough to keep them within bounds, or to remove weak or over-vigorous and non-flowering growth. It will be found of great advantage to apply a mixture of eight parts superphosphate, four parts sulphate of ammonia, four parts sulphate of potash, to all shrubberies in the spring at the rate of 1½–2 oz. to the square yard.

M. L. H.

Sodium Manuring, Effect of, on the Composition of Plants. By B. L. Hartwell and P. H. Wessells (*U.S.A. Exp. Stn., Rhode Island, Bull.* 153, March 1913).—Discusses the effect of sodium manuring as an addition to, or a substitute for, potassium salts.

A number of root crops were chosen for the experiments, the results obtained being very variable. Beets showed as much as 25 per cent. increase in yield, with a very slight decrease in average sugar content, but on the whole crop the total of sugar obtained was much larger.

On the other hand, mangels, onions, and potatos gave a reduced yield in consequence of the addition of sodium salts.—*C. P. C.*

Soil Analysis. By E. J. Russell, D.Sc. (*Jour. Bd. Agr.* xxii. 2 ; May 1915). Analysis is the method adopted by expert advisers for obtaining certain information about a soil. It includes chemical, physical, and bacteriological observations, and may be accompanied by general field observations. Field investigations are too laborious for ordinary use, and shorter methods are necessary which

express amounts of certain substances present having an important effect on crop production. Such methods are best when used for purposes of comparison, and the question as to whether a soil analysis is worth conducting depends largely on the possibility of comparing it with a similar soil whose capabilities are known.

In at least three distinct cases useful help can be given by the soil expert: (1) Where a grower wishes to know if he has a reasonable chance of obtaining results from experiments on similar soils, such as addition of lime, phosphates, or potash. The expert cannot be absolutely certain, but the chances are that he comes out right. (2) Where a grower wishes to adopt some system of cropping or soil treatment known to give good results elsewhere in the locality. Here examination may reveal some vital difference not obvious to casual inspection. If the grower is made aware of the difference he can make his plans accordingly. (3) Where a man wishes for complete information as to soil on a new farm or estate. Here chemists, physicists, and bacteriologists could each say much without exhausting the subject. In such a case the expert should be consulted on the spot, and a selection made and plans discussed. An expert may be able to point out marked differences in the soil from that where a proposed scheme of cropping was known to be a success.

The problem becomes very difficult when the expert gets away from comparison, and a good deal of balancing of probabilities becomes necessary—always a delicate business and likely to miscarry. It is therefore better for the expert not to give more than a general opinion, and to submit two or three alternative schemes for consideration and trial.—*G. C. G.*

Soil Constituents, Some Organic. By Edmund C. Shorey (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 88, Jan. 1913).—The question of the existence of organic phosphorus compounds has now been settled, in the affirmative, by the isolation of the nucleic acids. Fifteen new organic compounds have been isolated, and a description of their properties is given.—*C. P. C.*

Soil Temperature and some of the most important Factors influencing it, An Investigation on. By Geo. J. Boujoucos (*U.S.A. Exp. Stn., Mich., Tech. Bull.* 17, Feb. 1913; 54 figures).—The figures and data are very interesting and valuable. Colour is shown to have no effect on radiation, but very considerable on the amount of heat absorbed.

Horse manure gave the greatest increase in soil temperature, cow manure intermediate, sheep manure least.

A salt solution had a marked effect on the raising or lowering of soil temperature, according to the density of the solution added. The quantity of organic matter present or added influenced temperature markedly, the soil containing the greatest amount thawed slowest, but held a higher average temperature throughout the whole year.—*C. P. C.*

Soil, The Atmosphere of the. By E. J. Russell and A. Appleyard (*Jour. Agr. Sci.* vol. vii. pt. 1, pp. 1–48, March 1915; figs.).—The remarkable relationships existing between micro-organisms of the soil and the growth of plants have given rise to numerous researches on the bacteria, fungi, and protozoa of the soil. In order that further advances in our knowledge of these organisms may be made, it is recognized that it is necessary to discover the conditions under which life in the soil goes on. The present paper is a contribution to this preliminary work.

The top six inches of the soil was selected as proper for the experimental work, although there is in fact but slight variation throughout the first twelve inches. Different surface soils were examined, some being under a crop, others bare, some manured, others unmanured. Minor fluctuations in composition were shown, but the broad conclusions are true of all the types selected.

The total pore space is about one third of the total volume of the soil; from 10 to 20 per cent. of this space is occupied by soil air, the remainder being occupied by water. The soil air contains oxygen, nitrogen, and carbon dioxide. In composition it is generally similar to the ordinary atmosphere, but contains less oxygen, more carbon dioxide, and, usually, more nitrogen, the differences being due to the absorption of oxygen and the evolution of carbon dioxide by the inhabitants of the soil. Diffusion is constantly tending to make the proportions in soil air and in ordinary air equal. The absolute differences are small. For example, the average composition of soil air from arable land was oxygen 20·6 per cent., nitrogen 79·2 per cent., carbon dioxide ·25 per cent., but taking relative

differences it is seen that (carbon dioxide in ordinary air being taken as ·04 per cent.) the last-named gas is six times more abundant in arable soil air than in ordinary air. There is a large seasonal variation in the proportion of carbon dioxide in soil air, which reaches a maximum in late spring and again in late autumn, at which periods rapid biochemical changes are taking place in the soil. The highest and lowest percentages of carbon dioxide found in the soil air were ·37 and ·08 respectively.

The free air filling the soil spaces is not the only air in the soil, for on subjecting the soil to diminished pressure it was found that the vacuum persistently began to fall soon after exhaustion appeared to be complete. Thus gas was being evolved from the soil and was found to be composed of over 90 per cent. of carbon dioxide, with a small percentage of nitrogen and a still smaller percentage of oxygen. The gas is dissolved in the soil moisture and other soil constituents. Consequently the soil conditions are such that both aerobic and anaerobic organisms can find suitable surroundings. (In the appendix to the paper is given a description of the apparatus used for collecting the soil air.)—*J. E. W. E. H.*

Soils, Occurrence and Nature of Carbonized Materials in. By Oswald Schreiner and B. E. Brown (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 90, Dec. 1912; 7 plates). —Describes methods of estimating carbon in soils.—*C. P. C.*

Soy Bean, Report on the. By A. G. Turner (*Agr. Jour. Cape G. H.* vol. vii. No. 1, Jan. 1914; pp. 67–77).—Treats of the Soy Bean both from its cultural and commercial sides. The conclusion is that this crop "can be grown throughout South Africa." A list of methods of employment both as human and animal food is appended, as well as the various purposes to which the oil may be applied. "It is estimated that Great Britain and Europe can take ten million tons of soy beans per annum in the event of the beans being used for human as well as for animal consumption and for industrial purposes."—*A. A. K.*

Spiraea arborea. By W. J. Bean (*Kew Bull.* 1914, p. 53; plate).—A fine Spiraea, allied to *S. Lindleyana*, introduced from Hupeh. (See JOURNAL R.H.S. xl. p. 221.)—*F. J. C.*

Spraying Machines, Accessories. By W. H. Goodwin (*U.S.A. Exp. Stn., Ohio, Bull.* 248, pp. 29; 9 plates).—A concise description of the various sprayer fittings, in several sections, is given in the above bulletin, the section dealing with nozzles and valves being especially good. Six tables show the size, weight, capacity, and spraying value of each type of nozzle, and two plates illustrate types of spray thrown by them.—*C. P. C.*

Strawberry Runners, To Prepare for Planting. By H. C. (*Rev. Hort. Belge*, May 1914, p. 173).—To produce vigorous and fruitful strawberry plants much care must be bestowed upon the runners. As soon as the parent plants have done fruiting, weeds, dead leaves &c., should be removed from the bed, and it should be well manured (40 gr. superphosphate, 30 gr. sulphate of potash, and 40 gr. sulphate of ammonia to the square metre, lightly forked in). Only three to four runners should be left on each plant. Those should be reserved which come from the most fertile plants. Do not let the runner develop beyond the first plant, and water when necessary. The young plants may also be rooted in 3-inch pots in good soil and planted out at from 10 to 12 inches apart as soon as they have rooted. They should be in full sun and be dressed with the mixture recommended above. They may be put into their permanent place in August or September.—*M. L. H.*

Sulphur as a Stimulant to Plant Growth. By F. de Castela (*Jour. Dep. Agr. Vict.* p. 290; May 1914).—M. Chauzit's conclusions are—

1. Sulphur acts favourably on the growth of the vine (using 180 lb. to the acre).
2. The greater the quantity of organic matter in the soil the more pronounced is the action. When the quantity of organic matter diminishes, the effect of the sulphur diminishes also, becoming practically nil in the absence of organic matter, as was found by Messrs. Vermorel & Dantony.
3. The action of sulphur is all the more evident if it be thoroughly mixed with the organic matter on which it is to act.
4. The yield increases with an increase in the quantity of sulphur used.

C. H. H.

Sulphur Content of some typical Kentucky Soils, The. By O. M. Shedd (*U.S.A. Exp. Stn., Kentucky, Bull.* 174).—A comparison of soils, to show the depletion of and the necessity of adding sulphur to many soils, is given.

A table is given comparing the depletion of sulphur by various crops, and also the total amount of sulphur present in certain plants, as shown by the new method of determination as compared with the older ash percentages. Some of these are as follows :—

Name.	Total Sulphur as estimated by new method.	Ash Percentage of Sulphur, old method.
White Corn	·170	·004
Onions	·568	·120
Wheat Gluten	·860	·004
Turnips	·740	·359

The addition of flowers of sulphur to the soil has given very decided increases in the yields of various crops, such as beans, peas, onions, beets, celery, &c.

C. P. C.

Sweet Peas. By A. C. Beal (*U.S.A. Exp. Stn., Cornell, Bull.* 342, pp. 215–360 ; 25 plates).—In addition to the classification and description of a large number of varieties of Sweet Peas, the following points of interest are noticed. In autumn planting, delay the operation as late as possible, but avoid sowing the seed in cold, wet, heavy soil. In spring, white-seeded varieties must not be planted before the ground has thoroughly thawed. Black-seeded varieties retain their vitality better than white-seeded sorts.

The best market varieties are 'Dorothy Eckford,' 'King Edward VII.,' 'Brilliant Blue,' 'Lady Grizel Hamilton,' 'Prima Donna,' 'Blanche Ferry,' 'Countess Spencer,' 'Nora Unwin,' 'Asta Ohn,' and 'King Edward Spencer.'

S. E. W.

Tilia Oliveri. By W. J. Bean (*Kew Bull.* 1914, p. 53).—A lime with foliage silvery below as in *T. tomentosa*, and probably as ornamental and hardy as that species. Native of China.—*F. J. C.*

Tillandsia Benthamiana var. **Andreuxii** (*Bot. Mag.* tab. 8576).—C. America. Nat. Ord. *Bromeliaceae*, tribe *Tillandsicae*. Herb, succulent. Leaves clustered, ensiform acuminate, 6 inches long. Inflorescence spicate, 3 inches long ; flowering-bracts ovate, rosy pink ; petals deep violet.—*G. H.*

Tobacco, The Control of Diseases and Insects of. By James Johonns (*U.S.A. Agr., Exp. Stn. Wisconsin, Bull.* 237, May 1914, pp. 1–34 ; 9 figs.).—This deals concisely with the principal diseases caused by fungi and insects of this important economic species, and suggests various remedies which have been found to be satisfactory in Wisconsin. They include systematic steaming of the soil as a preventive of "bed rot" (*Pythium* and *Rhizoctonia*) and "root rot" (*Thielavia basicola* Zopf.) and also as a means of killing weed seeds. For the various rusts of tobacco, no completely satisfactory methods of control have been evolved at present. For those diseases of packed tobacco, black rot and other moulds, the regulation of the percentage of moisture and the temperature is suggested.

The principal insects affecting tobacco are various caterpillars which are destructive to the foliage. Spraying with a mixture of Paris green, 4 to 6 oz. in 50 gallons of water, and the use of poison baits, are suggested as remedies.

A. B.

Tomato, Black Spot. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxv. pp. 1069–1070).—In New South Wales much loss is caused to the tomato crop by Black Spot. The spot is caused by the entrance of bacteria through the damaged skin of the fruit ; the wound is then infected by *Macrosporium*. As the fungus grows under the skin, spraying after the disease has appeared is of little use. A regular supply of water and adequate shade prevent the disease. Spraying with lime-sulphur or Bordeaux mixture checks the development of Leaf Spot. Black Spot does not attack the round, smooth varieties of tomato as readily as the crinkled, irregular-shaped sorts.—*S. E. W.*

Tomato, Blossom-end Rot. By C. Brooks (*Phytopathology*, iv. pp. 345–374 ; Oct. 1914 ; figs.).—This rot is well known in England, and is characterized by the appearance of a blackish spot near the style when the fruit is one-half to two-thirds grown, which rapidly increases in size, finally spreading deep

into the fruit tissue. The affected tissue becomes black, hard, and leathery, and the tomato much flattened. The disease thus characterized appears to be the common 'black spot' of tomatos, too well known in this country. It has been ascribed to a variety of causes, principally to fungi or bacteria. The author carried out a very large number of experiments with the object of ascertaining the exact cause of the trouble, and concludes that the disease is not primarily due to bacteria or fungi. Plants are most susceptible when in a condition of great activity, and either excessive watering or a sudden check in the water supply may produce the disease. Ammonium sulphate, dried blood, cottonseed meal, and heavy applications of horse stable manure all increased the disease, while sodium nitrate and lime decreased it. Raising the soil temperature of greenhouse plants increased the disease. The author believes that the increase in the disease from heavy watering is due to the development of harmful humic and ammonium compounds and an accompanying decrease in nitrates. Susceptible tissue has more starch and more oil than normal tissue, and its cell sap has a higher osmotic value.—*F. J. C.*

Tomato Seed, On the Presence of Hybernating Mycelium of Macrosporium Solani in. By I. Massee (*Kew Bull.* p. 145, June 1914; plate).—The fungus *Macrosporium Solani*, to which the author attributes Tomato black spot, is shown to penetrate the seed of diseased fruits. On germination either the embryo is killed outright, or the mycelium grows along with the seedling and produces black stripe in it.—*F. J. C.*

Tomato Soils (*Queensland Agr. Jour.* p. 234; April 1914).—Although the tomato can be grown on many different types of soil, the highest yields are secured on sandy loam soils, well drained and comparatively rich in plant food. On the heavier soils, the yields have not been so large as on the lighter types, although the fruit is usually more firm and meaty, which makes them better for canning. On lighter soils usually the fruits are more juicy and the flesh less solid. The fruits of many varieties, especially the early ones, are smoother and more symmetrical when grown on sandy soils. Tomatos should not be grown in the same ground for more than one year out of three.—*C. H. H.*

Tools Preserved by Use of Linseed Oil (*Jour. Dep. Agr. Vict.* p. 425; July 1914).—Raw linseed oil is the best for application to wood, enhancing its durability and preventing decay, as well as making it wear smoothly to the hand. The oil fills up all pores in the wood, congeals there, and prevents the entrance of moisture and fungus spores.

All farm and garden tools made of wood, or having wooden parts or handles, when new, should be washed clean of all dirt, and then as much raw oil as they will absorb should be applied by means of a flannel, rag, or a brush, choosing a hot day for the purpose. They should be placed in the sun, and as the oil dries more should be given until they are saturated. Rake, spade, pick, axe handles, &c., treated in this manner will outlast even the steel parts, if the tools are kept sheltered from the weather when not in use. Carpenter's and small wooden tools should be dealt with in the same way.

Farm vehicles, wheels, and wooden machines have their life much prolonged by an annual application of raw oil.—*C. H. H.*

Trees, Hygiene of. By Alphonse Dachy (*Rev. Hort. Belge*, March 31, 1914).—In selecting washes for cleansing trees it is well to remember that lime enters into the composition of many of them, and such mixtures should be avoided in dressing plants trained on wire supports or fastened with wire, for the action of lime on the iron is most destructive. If lime is considered essential it should at least be slaked lime. As it is present, however, chiefly used as a vehicle to ensure the principal curative substance actually adhering to the branches, there are other agents which may well take its place.

A salt wash makes a most efficacious fungicide and may be made as follows for cases in which the use of lime is inadvisable: Make a liquid just thin enough to use through a sprayer, by mixing *quite smoothly* about 2 to 3 kilogrammes of clay in a hectolitre of water. Then add 10 kilogrammes of kitchen salt.—*M. L. H.*

Trichocaulon pictum (*Bot. Mag.* tab. 8579).—Little Namaqualand. Nat. Ord. *Asclepiadaceae*, tribe *Stapelieae*. Herb, stem subglobose, 1½–3 inches long, 1½–2 inches thick, tubercled. Flowers fascicled with 2–4 together. Corolla ½ inch across, whitish, with purple dots and short streaks.—*G. H.*

Trollius chinensis (*Bot. Mag.* tab. 8565).—North China. Nat. Ord. *Ranunculaceae*, tribe *Helleboreae*. Herb, perennial. Leaves palmately 5-partite; flowers 2½ inches across, orange-coloured; petals 20, linear.—*G. H.*

Vegetables, Modern Methods of Raising under Glass. By A. Stappaerts (*Rev. Hort. Belge*, March–June 15, 1914; figs.).—A series of articles on growing vegetables under frames or cloches. In the former case designs which can be easily and cheaply carried out at home are given, and for market gardening frames which can be taken to pieces and put away when not in use are strongly recommended. The points aimed at with every form of forcing for market is so to space your crops and such a succession to adopt that your glass may never be a moment not in use, and may never, in the case of cloches, have to be carried far to its next duty.—*M. L. H.*

Viburnum Harryanum. By W. J. Bean (*Kew Bull.* 1914, p. 53).—An evergreen shrub, from 6 to 8 feet tall, with black fruits. Named for Sir Harry Veitch. Introduced from W. China.—*F. J. C.*

Walnut Tree, Whipping (*Jour. Dep. Agr. Vict.* February 1915, p. 78).—No doubt the object of flogging the walnut trees was a rough method of producing upon aged trees a more vigorous and a greater quantity of spring or nut-bearing wood-growths, thereby increasing the crop. Many growers still maintain that flogging the tree to harvest the crop has a beneficial effect upon the future season's crop.

There is little doubt that light pruning and the removal of overcrowded branches are just as beneficial to the walnut tree as to other trees by stimulating old and forming new growths, and allowing free access of light and air to the inner branches of the trees.—*C. H. H.*

Walnut-trees for Victoria (*Jour. Dep. Agr. Vict.* February 1915, p. 153).—California having by selection improved on the original old English walnut, young trees grafted or budded of the following varieties—Chase, Concord, Eureka, Franquette, Placentia and San José—are recommended to be introduced from America into the country.—*C. H. H.*

Watercress, The Cultivation of. Anon. (*Jour. Bd. Agr.* xxi. pp. 1093–1098; March 1915; plates).—An account of commercial growing of both brown and green watercress, with estimates of the cost of the operations involved.
F. J. C.

Waterproofing Coats (*Queensland Agr. Jour.* p. 357; May 1914).—Dissolve ½ lb. shredded yellow soap in 1 quart of hot water. Then stir in 1 gallon of boiled linseed oil and 3 oz. of turps. Give the material two or three coats of this.
C. H. H.

White Flies in Florida, Spraying for. By W. W. Yothers (*U.S.A. Dep. Agr., Bur. Ent., Cir.* 168, April 1913).—White flies are destructive to the citrus trees in Florida, causing the trees to be covered with a sooty mould, which, in conjunction with loss of sap, causes a reduction in crop of from 25 to 50 per cent.

Two types of white fly are described, and several mixtures are recommended for their destruction.

A special formula is given as highly efficient :—

Whale oil soap	8 lb. or 1 gallon.
Paraffin oil	2 gallons.
Water	1 gallon.

The paraffin should be 24° or 28° Baumé. Place soap in 5-gallon receptacle, add oil slowly while vigorously stirring, so as to form emulsion.—*C. P. C.*

White-Pine Blister Rust. By Perley Spaulding (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 116, pp. 1–8).—This paper is intended as a supplement of Bulletin 206, "The Blister Rust of White Pine" caused by *Cronartium ribicola*. It deals with some further outbreaks of the disease. Near the original centre of infection were a single *Ribes nigrum*, some *R. vulgare*, and some *R. Grossularia* whose foliage was badly attacked by the uredospores. Apparently they served as an intermediate host and are supposed to enable the fungus to winter, though experiments gave negative results. The chief hosts, however, are the pines, including *Pinus Strobus* and *P. excelsa*, which bear the æcidiospores.

The control measures suggested are the total destruction of the infected white pines and *Ribes nigrum*.—*A. B.*

White Pine under Forest Management. By E. H. Frothingham (*U.S.A. Dep. Agr., Bull.* 13, February 24, 1914).—Of all the trees of eastern North America, white pine best combines the qualities of utility, rapid growth, heavy yield, and ease of management. Its former abundance and the cheapness and varied usefulness of its lumber made it an important factor in the development of the States in which it grew, and even of regions far outside of its natural range.

The history of white-pine lumbering begins with the first settlement of the country. In 1623 mills were set up in New York, and by 1635 white pine was being exported from New England. At that early date little was known as to the available supply, even in the country close to the shipping points, and in 1650 fears were expressed in New England that the timber would soon be exhausted. For more than two centuries, however, the white-pine forests of the Eastern States yielded an ever-increasing output of lumber. The Louisiana Purchase in 1803 opened up in New Orleans a profitable market for the white pine of south-western New York and north-western Pennsylvania, and immense rafts of logs were floated down the Ohio and Mississippi rivers from the region about the headwaters of the Allegheny.—*A. D. W.*

Wire-worms in the Vegetable Garden (*Queensland Agr. Jour.* p. 377; June 1914).—Wire-worms sometimes destroy beds of lettuce, endive, cauliflower, &c. The best way to get rid of these pests is to trap them. Cut up some carrots and beets, and stick the pieces into the ground all over the beds to be protected. When these are taken up on the following day, it will be found that the worms have eaten their way into them. The traps should be lifted with a trowel, because many wire-worms will be found in the soil around them. The only crop which the wire-worm has an objection to is mustard; if, therefore, a crop of mustard be planted on land infested by the worm, it will perish from starvation.
C. H. H.

Wool and Leather Wastes. By E. J. Russell (*Jour. Bd. Agr.* xxi. pp. 1087–1092; March 1915).—Wool waste or shoddy is more abundant this year than usual, owing to the increased output of woollen cloth from the Yorkshire mills. Its decomposition is not effected in one season but the results of its addition to the soil are evident for two or three. Its application is beneficial to all ordinary crops on both light and heavy soils. The usual rate of application is 10 cwt. to the acre (7 lb. to the square rod), and its nitrogen content (upon which its value is based) varies from 2 per cent. to 15 per cent., the former containing much dirt and cotton waste. It can usually be purchased in Yorkshire at 4*s*. to 5*s*. the unit of nitrogen, and to this the cost of carriage, which is rather high, must be added.

Leather waste is very resistant to decomposition, and its value as a fertilizer is almost *nil*, though it is to be feared that it is used after grinding by unscrupulous dealers in making compound manures, for it may contain up to 7 per cent. of nitrogen. It may be readily recognized in compounds by the tendency it has to float on water and swell up.—*F. J. C.*

Woolly Aphis: a Japanese Formula for its Destruction (*Queensland Agr. Jour.* July 1914, p. 40).

Rape-seed oil	$3\frac{1}{2}$ pints.
Sulphur	$1\frac{1}{2}$ oz.
Turpentine	$7\frac{1}{3}$ oz.

The rape-seed oil should be boiled alone for a very short time, followed by adding the turpentine slowly, stirring continually until they are thoroughly mixed. Stir in the required amount of well-crushed sulphur. Use a strong fire and allow to cool, when the mixture assumes a darkish colour. Paint the attacked parts of the trees. This wash can also be recommended for use in the control of other aphides and the destruction of their eggs.—*C. H. H.*

Xenia. By Abrial (*Rev. Hort. d'Alg.*, No. 3, March 1914, p. 99).—Foche has given the name of *Xenia* to facts which do not concern heredity, but which are fundamentally of the same nature as Telegonia. Cases of Xenia are perhaps more numerous than is generally supposed. Some authors deny the facts altogether, while others cite some which are perhaps not exactly conclusive. It is probable that the pollen germinating on the style of a plant of a different genus, species, or even variety may, by its development in the tissues of the plant, modify the neighbouring cells, and thus even the whole female organ, that is the pericarp. At maturity, if the modifications due to the strange pollen on

the female organ are appreciable, we shall have a modified fruit, which may resemble the fruit of the parent plant, or, which is more probable, may develop a form intermediate between the two parents.

Since the great discovery of Professor Guignard on double fertilization, it may be said that each seed is derived from two eggs. The first, the most important, gives birth to the embryon, and the second, less important certainly, but still important also for the development of the first, gives birth to reserve tissue. At maturity, this reserve tissue or albumen does not exist in every seed; there are albuminous seeds and exalbuminous seeds. These last have at one time been albuminous, but the embryon during its development has gorged itself on this substance until at complete maturity no more remains.

As these two eggs have been each formed by the fusion of a male and a female cell, it follows that if the male and female plants are alike there will be no difference in the seed. If, on the other hand, the parent plants are unlike each other, whether they belong to two varieties, two species, or even to different genera, it follows that the seeds will be different, and all the more different if they are albuminous, since they will contain the remains of the two eggs. Thus Peas are exalbuminous. Some varieties have sweet cotyledons. The two forms crossed give seeds of which some have sweet cotyledons and some floury cotyledons.

Maize has albuminous seeds. In some varieties the albumen is floury, and in others the albumen is sweet and the seeds are wrinkled. The two forms crossed give ears with sweet wrinkled seeds mixed with floury unwrinkled seeds. The most celebrated case of Xenia, according to Tillet de Clermont-Tonnerre, is that of the apple-tree at St. Valery-en-Caux. This apple, sterile through the abortive stamens, fruits when it is fertilized by strange pollen. The fruits recall, in form, shape, colour, and taste, those of the mother plant. It is even said that the ladies of the district come and each make their own apple by bringing from their own gardens the pollen of the apple they desire. Other cases of Xenia are equally remarkable. According to several authors, fruit-trees lend themselves better than other plants to the phenomena of Xenia, and it is possible that well thought-out fertilization might give curious and interesting examples.

M. L. H.

Zingiber Mioga (*Bot. Mag.* tab. 8570).—Japan. Nat. Ord. *Scitamineae*, tribe *Zingibereae*. Herb. Leaves linear-lanceolate, 10 inches long. Calyx 1 inch long. Corolla &c. pale yellow.—*G. H.*

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PART II.

RECENT INVESTIGATIONS ON THE PRODUCTION OF PLANT FOOD IN THE SOIL.—I.

By E. J. RUSSELL, D.Sc.

[Being the Thirteenth Masters Lecture, read June 8, 1915; Sir DANIEL MORRIS, K.C.M.G., D.Sc., in the Chair.]

FROM time immemorial the soil has been recognized as the source from which plants draw their sustenance, and therefore on which we ourselves, in common with the animals, depend for our food.

"It is the Earth," wrote PLINY* some 2000 years ago, "that, like a kind mother, receives us at our birth and sustains us when born. It is this alone, of all the elements around us, that is never found an enemy to man. The body of waters deluges him with rains, oppresses him with hail, and drowns him with inundations; the air rushes in storms, prepares the tempest, or lights up the volcano; but the Earth, gentle and indulgent, ever subservient to the wants of man, spreads his walks with flowers and his table with plenty; returns with interest every good committed to her care; and though she produces the poison she still supplies the antidote; though constantly teased more to furnish the luxuries of man than his necessities, yet even at the last she continues her kind indulgence, and when life is over she piously hides his remains in her bosom."

Most of the philosophers of ancient times, and up to the end of the eighteenth century, have something interesting to say about the soil, and in 1675 the famous JOHN EVELYN delivered his "Philosophical Discourse of Earth" to the Royal Society, wherein he summarizes

* PLINY, *Nat. Hist.* lib. 2.

the current ideas of his time. This discourse might have been the starting-point of a separate soil science. But unfortunately it was not sufficiently experimental to stimulate other investigators, and at the end of the eighteenth century, when the foundations of most of the modern sciences were being laid, there was no one of outstanding genius who took any special interest in the soil. In consequence it has never fallen into any of the conventional divisions of science, but lies in the borderland where the chemist and botanist meet the farmer and the gardener.

It is now recognized that the plant takes up something of everything which is dissolved in soil water, quite regardless of whether the effect is going to be good, bad, or indifferent. Even the most unlikely elements—gold itself and still rarer elements—have been detected in plants and have come in from the soil.

By long custom gardeners and farmers give the name plant food to those substances in the soil which help the plant to grow. I am retaining the expression in this sense, though it could be severely criticized from the physiological standpoint. Strictly speaking, the substances about which I am going to speak are not plant foods at all, but only the raw material out of which the plant builds up its food by a process infinitely wonderful and complex. But we shall avoid all ambiguity by giving our definition at the outset, and we can further disarm the criticism of the physiologist by inviting him to give us a better term that is equally simple.

We all admit the principle that we must be prepared to alter our vocabulary whenever the old terms would cause us to lose touch with the pure chemists and plant physiologists. But the changes in vocabulary of any one branch of science are now so rapid that one shudders to think what would happen to a borderland subject that tried to keep pace with two or three sciences. We may therefore be allowed to keep to our old words provided they convey a definite meaning to us, and that we make this meaning perfectly clear.

By plant food from the soil we shall understand those substances which the plant takes from the soil and which it utilizes in building up its tissues.

The plant food obtained from the soil is, roughly speaking, of two kinds:

(1) Substances already formed in the soil, which were part and parcel of the minerals from which it was derived.

(2) Substances not originally present, but which have come in since the soil was laid down as the result of the changes produced by vegetation.

Both of these are equally important, and both have given rise to a vast amount of research work. But each requires a different type of investigation, and so it has happened that each has been studied in different laboratories and under somewhat different conditions. The substances derived from the rock minerals, often called

the mineral plant foods, including phosphates, salts of potassium, calcium, &c., have been studied in the main from geological and physico-chemical standpoints, while those resulting from vegetation have been worked at almost entirely from the biochemical standpoint. But the division line is only in the laboratory and does not exist in Nature; we shall see that all of the plant nutrients fall into each group.

The beginning of the soil goes back to remote ages when the particles of sand, grit, or clay got split off from the original rocks and began their wanderings by stream, wind, or glacier that have finally brought them to their present place. Many of their properties were determined during these wanderings and cannot now be altered; thus some of the most striking differences between the red soils of South Devon and the grey soils of Dorset arose out of the differences in conditions between Triassic and Lias times; these differences have persisted all through the ages, and we cannot now go back and undo the work of the past.

But the mineral particles do not constitute soil. The final stage in soil formation is not complete until vegetation has sprung up and died, and its remains have mingled with the mineral fragments and begun to decay. During its lifetime vegetation takes certain substances from the mineral matter and the atmosphere and builds them up into complex organic matter. Like other constructive work, this process requires energy, which in this case is derived from the sunlight and is stored up in the complex substances of the cell tissues.

When the plant dies and its remains mingle with the mineral fragments it begins to decay. The whole process then reverses: instead of a building up there is a breaking down; the fabric of complex material slowly elaborated during life is disintegrated and resolved into the simple substances out of which it was formed, and all the stored-up energy is dissipated. The old life is cleared away and the ground is left clear for new life; the old plant tissues are converted into food for another generation of plants. So prodigal is Nature with life that even this process of dissolution and decay affords the means whereby more life may manifest itself. A whole population of the most varied description springs up in the soil, feeding on these plant tissues, deriving its energy from the energy stored up during the lifetime of the plant, and reversing completely the changes effected by the plant.

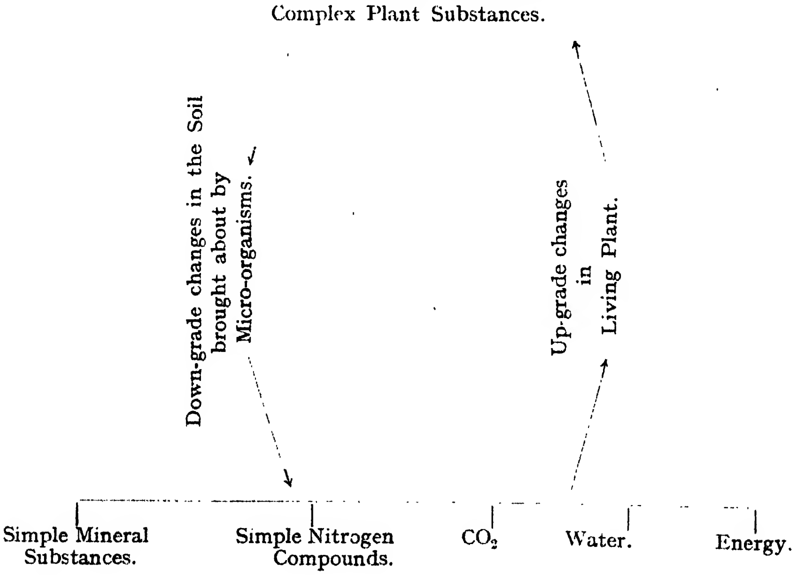
SCHEME SHOWING HOW SOIL IS FORMED.

Mineral fragments	+	Plant Residues	=	Soil
[No energy.]		[Organic matter comprising Carbohydrates (soft cellulose, gums, &c.) Cellulose (resistant fibres, &c.) Proteins Mineral substances Waxes.]		[Comprising Mineral fragments Organic matter Sources of energy Micro-organisms.]

So the cycle is completed. Starting with certain simple materials, the plant protoplasm builds up complex plant substances, fixing the sun's energy by means of the transformer chlorophyll; this is the constructive part of the cycle. Later on, the other part—the destructive change—begins; the complex substances break down and are resolved finally into the simple substances with which the change began. Things are now as they were, excepting only that these simple substances have for a time been caught up in the wheel and have served for the manifestation of life; they have then been put down again, ready to serve as nutrients for a new generation of plants.

The soil is the medium in which this second part of the great cycle of life goes on. It is so intimately bound up with this cycle that one cannot separate them, or think of the soil apart from the changes occurring within it. This is the great distinguishing feature of the soil, marking it off sharply from a heap of mineral matter and bringing it out of the province of the mineralogist into the sphere of the biochemist. In the language of the laboratory, the soil has to be studied as a dynamic and not as a static medium, and we have to think of it as the seat of perpetual change.

Cycle of Changes between the Soil and the Plant.



The processes involved in the formation of soil may be seen at work on the little landslips that occur periodically on clay cliffs. With each new slip a new surface of subsoil is exposed as a heap of virgin mineral matter. Before long vegetation begins to spring up: frequently colt's-foot and Equisetum. This dies down and starts the process of soil formation; finally a very different type of vegetation

becomes possible. In order to follow the process more closely we have made at Rothamsted permanent beds of some of our clay subsoil, and have commenced systematic botanical, bacteriological, and chemical observations of the changes taking place.

The reverse process can also be seen at Rothamsted. A soil has been persistently cultivated for seventy-one years and all of the crop removed except the roots and the stubble: the organic matter and the energy supplies are therefore running out, and we are gradually approximating to the original condition. It is interesting that here also colt's-foot and Equisetum flourish, although we hardly find them on our other plots.

The system we have to study is this mass of mineral particles intermingled with plant residues and living organisms; and our object is to trace the stages by which the decomposition proceeds and the energy runs down.

The first obvious change is that the plant material loses its green colour and goes black; this can easily be observed when leaves are dug into the soil or dragged in by earthworms. The old chemists were much interested in this black substance, and in the early days of the last century, when men of science were very prodigal with new names for new forces and new substances, they supposed it to be made up of a number of compounds which they called ulmic acid, crenic acid, apocrenic acid, humic acid, &c. No one has ever succeeded in preparing any of these compounds in any state that would satisfy a modern chemist, and there is no evidence whatsoever that they exist; but their names have been piously handed down through long generations of students, and they still occasionally turn up in popular articles and in answers to examination papers.

So far this black material has defied analysis. Modern organic chemistry has been developed largely to deal with liquids and crystals; this black substance is neither, but is an amorphous glue-like body of the class known as colloids. Physical chemists in several countries are (or were) working at colloids, and we may yet hope to see some method of resolving them. The way out of such a predicament is to give the substance a non-committal name, and so we retain the old designation "humus."

Part of the humus is soluble in alkalis, and this was supposed naturally enough to be necessarily of more value in plant nutrition than the insoluble part; analytical methods were therefore devised for estimating its amount. It does not appear, however, that anyone has ever tried the fundamental experiment of testing whether the soluble part is really superior to the rest. *A priori* assumptions in our subject are particularly treacherous, and at Rothamsted the question has recently been under investigation. So far as present experiments have gone, the removal of this soluble humus has failed to make any appreciable difference to the growth of the plant, or to the physical and chemical properties of the soil. Further experiments with various types of soil would be necessary before pronouncing too

definitely, but at present there is nothing to indicate that the soluble humus plays the controlling part in soil fertility formerly attributed to it.

A more fruitful method has been to study the fate of the separate plant constituents and ascertain the changes through which they pass when decomposed in the soil. For this purpose the plant substances may conveniently be divided into several groups: the carbohydrate group, including soft celluloses, gums &c.; the hard resistant fibres made up of resistant cellulose; the proteins; the mineral substances; and the waxes. Of these we may at once dismiss the waxes, as they appear to decompose only slowly in the soil. Nor can we say much about the changes in the mineral matter, as these are not sufficiently investigated.

Very little is known about the decomposition of the carbohydrate constituents except that it is rapid. Apparently a considerable number of organisms is able to bring it about, including bacteria, moulds, and larger forms ranging up to earthworms. So far as is known the process seems to be analogous to the retting of flax and the formation of skeleton leaves. It is no doubt this material that furnishes most of the energy for the soil population, and we shall see shortly it is indispensable for some of the soil changes that can go on only as long as energy is put into them.

Its decomposition has another important effect. It forms the bulk of the cell walls, and as soon as it is gone the plant residues lose their structure and definitely begin to mingle with the soil, becoming subjected to the various decomposition agencies at work therein.

The harder resistant cellulose, making up the leaf skeletons, the fibres, &c., takes longer to decompose in the soil and is not attacked by nearly so many organisms. No single organism is known with certainty to decompose it under the aerobic conditions obtaining in the soil, though an association of organisms breaks it down fairly readily. In absence of air it decomposes with formation of two inflammable gases, marsh gas and hydrogen. This decomposition goes on at the bottom of stagnant ponds and in marshes, and the bubbles of inflammable gas can be got by stirring up the mud with a stick. There is, however, no evidence that these gases are formed in the soil, and so far as can be judged the change proceeds in quite a different way.

The decomposition of protein in the soil is of altogether different significance, because in this case it is the products that are of chief importance. It is difficult to study this change in the soil because of its complexity, and no progress was possible with the early stages until prolonged laboratory experiments had shown the general nature of the decomposition. Even now we do not know *for certain* that the stages are the same in the soil as in the laboratory, but they seem to be, since typical laboratory products have been found by SCHREINER and his co-workers in the soil, including amino- acids, diamino- acids, purin bases, &c.

SCHEME SHOWING SIMILARITY BETWEEN PROCESS OF DECOMPOSITION OF PROTEIN IN SOIL AND THAT OF HYDROLYSIS IN THE LABORATORY.

In Laboratory	Amino- acids (various)	Diamino- acids (Histidine, Arginine)	Purin bases (various)	Humus
Found in Soil	Amino- acids not identified	Diamino- acids (Histidine Arginine, &c.)	Purin bases	Humus

In the soil, however, the decomposition proceeds further, and the various intermediate products break down to yield ammonia. So far as is known, this change is mainly brought about by bacteria and possibly other organisms; recent investigations at New Jersey suggest that moulds also may be effective. It is certain that considerable numbers of different organisms are able to bring about the change. There are also indications that some of the remarkable chemical ferments known as enzymes are active.

Ammonia is the last stage in the decomposition of the proteins. If it were left to itself it would change into the carbonate, a substance which in small quantities can be taken up and utilized by the plant, but which is harmful in larger quantities, besides having rather a bad effect on heavy soils, making them very sticky.

But the ammonia is not left to itself. It is at once seized upon by another set of bacteria, quite distinct from all others, which oxidize it to nitrite; and this in turn is seized upon by an organism, also quite distinct from any other, and oxidized to nitrate.

STAGES IN THE DECOMPOSITION OF PROTEIN.

Protein
↓
Amino-acids
↓
Ammonium compounds
↓
Nitrites
↓
Nitrates

The decomposition of the protein thus involves two completely distinct processes: the production of ammonia, which takes in at least two stages, and the production of nitrate, which also involves at least two stages. It so happens that in natural conditions the last stages proceed more rapidly than the earlier ones, so that each set of organisms may be regarded as having to wait for those engaged in the earlier stages. This arrangement seems at first sight wasteful, but it is really advantageous, because it prevents any accumulation of

intermediate products which, as we shall see later on, might be harmful both to bacteria and to plants.

The story of the nitrifying organisms is an old one, but it bears retelling. Only two organisms are known that can change ammonia to nitrite, and only one that can change nitrite to nitrate. All three are extremely small, and they are unique in that they build up their substance out of carbon dioxide, obtaining the requisite energy from the oxidation of the ammonia, and not from sunlight, as plants do. They do not require organic matter either for food or for energy supply —again a distinction from other micro-organisms; indeed many organic compounds are harmful to them. This property is so marked in culture solutions that all organic matter was long supposed to be harmful, but this is now known to be incorrect. Nitrification will take place in presence of organic matter; it is known to go on during sewage purification, and it takes place regularly on the outside of a dungheap. But there are two conditions which are highly detrimental to the nitrifying organisms, viz. acidity and lack of air. Provided these are avoided, the organisms will tolerate soil organic matter.

Running alongside of this decomposition is another. The amount of nitrate formed is never as great as one expects from the nitrogen in the protein, and the deficit is attributed to a loss of gaseous nitrogen. We have, therefore, two possibilities: the protein may change to nitrate or it may change to nitrogen.

Now the evolution of gaseous nitrogen is of no value whatsoever to the farmer or the gardener; on the contrary, it represents a dead loss, because the nitrogen is only dissipated. It is difficult to exaggerate the seriousness of this loss to the intense cultivator. One of our plots annually receives the liberal but by no means excessive dressing of fourteen tons of dung to the acre, containing 200 lb. of nitrogen. Of this about 50 lb. is recovered in the crop, and about 25 lb. remains in the soil; some also gets away in the drainage water. But about one half of the nitrogen cannot be accounted for, and presumably it goes off as gas at any rate the cultivator gets no benefit from it.

It is impossible to form a precise estimate of the losses of nitrogen in a market garden, but the conditions all favour high losses; still more do they do so in glasshouses where crops like cucumbers are being grown.

The market gardener is compelled to manure heavily in order to secure heavy crops, and his loss of nitrogen simply represents the extra price that always has to be paid whenever production is forced beyond a certain level. But just as the engineer has learnt how to increase the efficiency of an engine, so the cultivator has to learn how to increase the efficiency of his production processes. This cannot be accomplished until the nature of the soil-changes is better understood and the *cause* of the loss of nitrogen has been revealed. The action in the soil is too slow to allow of easy investigation; it is marked enough to cause serious loss over an acre in a year, but not in the

small amount of material one uses in the laboratory and the limited time available for an investigation.

TABLE SHOWING LOSSES OF NITROGEN FROM CULTIVATED SOILS, BROADBANK WHEAT FIELD, 47 YEARS, 1865–1912.

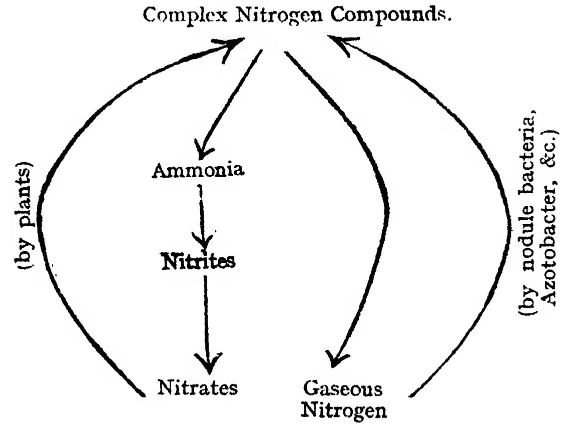
	Rich Soil (2) lb. to the acre.	Poor Soil (3) lb. to the acre.
N. in Soil, 1865	·175% = 4340	·105% = 2720
N. added in manure rain (5lb.) seed (2lb.) ..	9730	330
N. expected in 1912	14070	3050
N. found in 1912	·245% = 5730	·103% = 2510
Loss from Soil	8340	540
N. in crops	2550	750
Balance being dead loss ..	5790	− 210
Annual dead loss	123	− 5

When a difficulty of this sort arises the method adopted is to study parallel cases where the action is more pronounced. Two of these are being studied in some detail: the loss from a sewage bed and the loss from a manure-heap. Sewage presents a particularly interesting case, because here the loss is actually utilized as a means of sewage disposal, and the sewage chemist tries to encourage it just as strenuously as the agricultural chemist is trying to stop it. Indeed the situation is not altogether devoid of humour, for the community on the one hand spends many thousands of pounds in destroying nitrogen compounds in its sewage works, and on the other spends many thousands of pounds in purchasing nitrogen compounds for its soils. It was to find some way of bridging this difficulty that the Hon. RUPERT GUINNESS came forward and enabled us to secure at Rothamsted the services of Mr. E. H. RICHARDS, late of the Sewage Commission investigations, to make a systematic study of these losses. At Rothamsted we have selected the manure-heap because of its special agricultural and horticultural importance; in France, MUNTZ and LAINÉ took the sewage-bed. For a long time it was uncertain whether the gaseous nitrogen arose direct from the proteins by a process analogous to combustion or whether it was formed by decomposition of the nitrates. The problem is not yet solved, but the evidence is steadily accumulating against the combustion hypothesis, and so far as it goes it indicates that the nitrogen passes safely through the ammonia stage but gets lost afterwards. If this turns out to be correct, an interesting method of reducing the loss, if not of preventing it altogether, will become possible. It is obvious that if the ammonia (or the nitrate into which it is converted) is absorbed by the plant it cannot give rise to gaseous nitrogen in the soil, and therefore the loss will be eliminated by arranging the

conditions so as to facilitate absorption by the plant. It has been shown in agricultural practice that absorption of nitrate is greatly facilitated by properly balancing the manures, and we may hope for a good deal by adopting the same plan in horticulture. At present horticultural practice is, to say the least, indiscriminate, and there is considerable scope for improvement.

Again, however, a cycle is operating: opposed to all this loss of nitrogen are two sets of processes by which the losses are made good and nitrogen is fixed in the soil.

THE NITROGEN CYCLE IN THE SOIL.



The growth of leguminous crops, as is well known, adds to the stores of nitrogen in the soil through the combined operations of the plant and the organisms present in the root nodules. Leguminous plants occur in nearly all natural vegetation and their activity is very wide-spread, constituting by far the most considerable source of added nitrogen.

The second source of increased nitrogen is to be found in the activities of certain free-living bacteria which can fix nitrogen on their own account and do not require the co-operation of a living plant. At least two of some importance are known: Clostridium, which was the first to be discovered, is an anaerobic organism, *i.e.* it works in absence of air, but it can form a close association with aerobic organisms so that it can work in presence of air, and certainly its action is not precluded in the soil. The second, Azotobacter, is more potent and has proved far more attractive to investigators. It works very vigorously in crude cultures, but is less active in pure cultures; it used to be supposed to lose its potency on cultivation, but recent work has shown that it remains active in a suitable medium.

Both Clostridium and Azotobacter build up complex nitrogen com pounds from gaseous nitrogen, a process that requires energy; and both draw the necessary energy from the oxidation of the plant residues—presumably the carbohydrates—in the soil. It is reasonable to suppose that both organisms are active in the soil, but no rigid

proof has ever been given. The fact that land laid down to grass tends to gain nitrogen has been adduced in proof, but it is not really satisfactory.

TABLE SHOWING GAIN IN NITROGEN IN LAND LAID DOWN TO GRASS IN 1856 AND MOWN ANNUALLY. ROTHAMSTED.

	1856	1879	1888	1912
Per cent. of Nitrogen in top 9 inches ..	·152	·205	·235	·338

On such land the ammonia and nitrates are assimilated more rapidly and completely than in arable land, and there is therefore less liability to loss of nitrogen; further, leguminous herbage almost invariably grows for part if not for the whole of the year, making additions to the nitrogen supply. There is nothing to preclude the action of the free-living nitrogen fixers, but nothing to prove it.

These accumulated nitrogen compounds, whether built up by organisms associated with the Leguminosae or by the free-living forms, all break down by the processes just indicated and pass into nitrates with or without loss of gaseous nitrogen, according to the conditions.

From the standpoint of plant nutrition we may look upon the formation of nitrates in the soil as being the most important of all the processes, and for long it was regarded as probably the only one with which the agricultural chemist need concern himself.

But recently another possibility has been opened up. Not long ago the animal physiologists found that a mixture of fats, carbohydrates, proteins, and certain mineral substances, which ever since the beginnings of animal physiology had been looked upon as a satisfactory diet for any animal whatsoever, is really not sufficient. HOPKINS found that animals could not build up their tissues when fed with certain pure proteins, notwithstanding the ample nitrogen supply. Certain molecular groupings are needed, and in practice these can only be obtained in a mixed diet.

Now it is very attractive to apply this to plants. We all know how the gardener hankers after a mixed diet for his plants, and moreover we all know that the opinions of a good practical man are entitled to respectful consideration. It would be a simple matter to draw a parallel between the plant and the animal, and to suppose that the plant requires the mixture in order to ensure the supply of all necessary molecular groups.

There is, however, no experimental basis for such a view. Plants have considerably greater power than animals of building up the necessary proteins, and they can be, and at Rothamsted they regularly are, grown to perfection in water cultures containing no other nitrogen compound but sodium nitrate. We can find no evidence whatsoever that it is *necessary* to add any other nitrogen compound. But although not necessary it might be advantageous to the plant to receive some of

its groups ready made. SCHREINER and SKINNER * have drawn up a list of complex nitrogen compounds, which in their experiments increased the amount of growth even in presence of nitrate. This possibility is very interesting and requires considerably more investigation.

A much more subtle possibility has recently been discussed. Animal physiologists have found that even a proper mixture of proteins, along with purified fats, carbohydrates, and mineral substances, does not constitute a perfect diet; the animal makes no growth, but may even develop diseases like beri-beri, unless a little milk or vegetable juice is added. Until the nature of these compounds is known they are designated by the non-committal title "accessory substances." Again the interesting question arises: Do plants afford a parallel case? ARMSTRONG has already put forward the suggestive hypothesis that certain substances which he called "hormones" are advantageous to the plant in altering the permeability of the protoplasm and thus regulating certain vital processes, such as the intake of nutrient salts. Some interesting facts are on record. We have found at Rothamsted, for example, that cucumbers make better growth in water cultures containing soil extracts than in cultures without soil extract even when supplied with a complete nutrient solution. The experiment is not easy to interpret because of the difficulty of analysing the extract. But it would be attractive to think that some of the vague physiological conditions that trouble the grower are to the plant what beri-beri and similar diseases are to the animal—the result of withholding some essential or useful "accessory substance." BOTTOMLEY considers that certain substances obtained in the bacterial decomposition of peat are of this nature. Still more recently MAZÉ has published some remarkable results showing that maize fails to grow in water cultures containing all the recognized nutrient salts if these are chemically pure, but it grows normally as soon as tap water is introduced. No combination of added salts has as good an effect as the tap water.

GROWTH OF MAIZE IN WATER CULTURES.

(MAZÉ, 1915.)

Culture solution (pure)	+ Compounds of boron and arsenic . .	10
,, ,,	+ ,, ,, boron and aluminium . .	24
,, ,,	+ ,, ,, boron, aluminium, and arsenic	16·5
,, ,,	+ ,, ,, boron, aluminium, arsenic, and iodine	36·6
,, ,, (tap water)	. . . .	43

A considerable amount of work has obviously to be done before the problem can even be clearly stated.

But there seems to be no getting away from the fact that the nutrition of the plant in the soil is mainly bound up with the decomposition of the plant residues. In their original state these residues

* *U.S. Dep. of Agr., Bureau of Soils, Bull.* No. 87, 1912.

are valueless and may even be indirectly harmful to the plant: after decomposition they begin to be valuable. The speed and completeness of the decomposition are therefore of fundamental importance in soil fertility.

The agents bringing about the decomposition are numerous. Large organisms, earth-worms, &c., play an important part in the dissemination of the material, but otherwise do not seem to be essential; there is a sufficient variety of micro-organisms to complete the change without them.

The speed at which the change takes place obviously depends on the activity of the organisms and on the composition of the material. When for any reason it is slow there is a considerable accumulation of undecomposed substance which has characteristic and usually harmful effects on the soil. Certain of the grass-plots at Rothamsted have received large annual dressings of sulphate of ammonia for so many years that the soil has become distinctly acid. The speed of the decomposition processes has been reduced so much that the dead vegetation lies on the surface in thick mats, through which nothing can push its way except an occasional plant of sorrel or a runner of Yorkshire fog or *Alopecurus pratensis*. Thus the surface tends to become covered with peaty patches bare of vegetation. As soon as lime is put on, the decomposition becomes more rapid, the dead residues become decomposed and are cleared out of the way, so that the ground once more becomes covered with vegetation.

Persistent dryness produces the same effect with certain differences. In the first place the vegetation tends to be xerophytic, and the hard, narrow-leaved, waxy plants do not easily decompose, especially in the dry soil. The soil of a sandy common or woodland, for instance, often contains a considerable amount of nitrogenous organic matter, which, however, is mainly undecomposed pieces of bracken frond, &c.

Two distinct cases arise when the soil is too wet. In presence of calcium carbonate the general conditions favour a grassy type of vegetation which decomposes fairly well, and can at any time be made to go through the remainder of its stages in a normal way by making the conditions a little more favourable. These soils are therefore eminently suited for reclamation; they constitute the fen land.

Where, however, calcium carbonate is absent a much tougher type of vegetation arises—heathers, mosses, cotton grass, &c.—which even under the best conditions would not easily decompose, and under the conditions here obtaining only breaks down very slowly. Thick layers therefore accumulate, forming the great deposits of Sphagnum, &c., on the moors. As in the earlier cases, however, decomposition will proceed as soon as the conditions become favourable. Draining the moor removes the limiting factor and sets going the chain of processes: the peat may decompose right down to the solid rock or soil surface, or the processes may be stopped at some convenient stage, as in BOTTOMLEY's bacterized peat.

So far as evidence is available, it shows that the general decom-

positions of plant residues going on in the soil are substantially the same in all soils, but that the speed at which they take place varies, and may be slower than the speed at which the residues accumulate. These residues impart characteristic properties to the soils. It is thus possible to classify soils on the basis of the speed of decomposition as follows:—

Decomposition of residues quicker than accumulation.	Decomposition of residues slower than rate of accumulation.			
Normal soils.	Delayed by dryness.	Delayed by excessive wetness.		Delayed by cold.
		Calcium carbonate lacking.	Calcium carbonate present.	
Sands Loams Clays	Heaths Steppes	Peats Moors	Fen Black soils	Tundra

This scheme has the advantage of bringing out the fundamental law that the properties of a given soil are determined largely by its history. The climate to which it has been exposed plays a controlling part in determining the vegetation it carried in the past, while both factors determine the vegetation it can carry to-day.

One final reflection suggests itself. This cycle of change on which depends the success of our crops and our gardens is the work of soil organisms, but it is hardly likely to be the sole work of all the great variety one finds there. Can we step in and control the process, and make the organisms more useful? The idea of sitting down and directing things instead of labouring to do them has always been one of the laudable ambitions of mankind, and efforts have not been wanting to control the soil bacteria.

The attempt began some twenty-five years ago, when it was found that leguminous plants could be made to grow on the most sterile sand, manured only with calcium carbonate, potash, and phosphates, by the simple expedient of inoculating with the necessary bacteria. Nothing is easier than to put bacteria into the soil, and it was thought that if nothing else were needed then truly the golden age had come to the husbandman. The desire to get something for nothing is deeply implanted in the human breast, and here seemed to be fulfilment complete beyond the wildest hopes of the most visionary schemers. Unfortunately, inoculation has not come up to expectations: before it can hope to succeed all the soil conditions have to be made favourable both to the organisms and the plant; drainage, cultivation, supply of calcium carbonate, phosphates, potassium salts, moisture, suitable temperature, depth of soil all have to be provided, and by the time this is done the soil has generally been so greatly improved that inoculation is unnecessary. A few successful cases are on record where it may be presumed the necessary organisms were entirely lacking from the soil, but they are the exception and not the rule.

More recently it has been found that the useful organisms are on the whole more resistant to adverse conditions than the useless or harmful ones, and therefore that any process of gentle killing or partial sterilization will effect an improvement. Experience is bearing this out, but it is also demonstrating that the process cannot be carried out without considerable trouble. "Truly," says VIRGIL, "the farmer's path is not an easy one"; and in that still older Book the cultivator was told "in the sweat of thy face shalt thou eat bread." So far I cannot see that modern science promises any short and easy way of getting round this old injunction. What it has done is to dignify the husbandman's calling by revealing something of the wonder and beauty of the factors involved; it has shown also how his labour may be better directed as his knowledge of the forces of Nature becomes more and more extended.

RECENT INVESTIGATIONS ON THE PRODUCTION OF PLANT FOOD IN THE SOIL.—II.

By E. J. Russell, D.Sc.

[Being the Fourteenth Masters Lecture, read June 22, 1915; Sir J. T. D. Llewelyn in the Chair.]

The conclusion to which we were led in our last lecture was that the decomposition of the residue of plant materials in the soil is of fundamental importance in soil fertility, determining on the one hand the production of necessary plant nutrients and on the other the extent of the accumulation of organic matter in the soil, which in turn determines many of the soil properties.

We have now to study this decomposition a little more closely, and in particular to see how it is affected by changes in conditions such as commonly occur in nature.

We have seen that most of the changes can be brought about by a number of organisms. Thus the fixation of nitrogen may be effected by the aerobic Azotobacter or the anaerobic Clostridium. The production of ammonia can be brought about by moulds, by large bacilli, or by small micrococci, organisms differing considerably in their requirements. Thus the continuance of the decomposition is less dependent on the conditions than might *a priori* be expected, and if the reaction cannot be brought about by one set of organisms it can by another. Changes in conditions may alter the *speed* of the reaction or they may alter the agents bringing it about, but they have less effect on the *nature* of the change.

For example: the bacterial flora in acid soils devoid of calcium carbonate is very different from that in normal soils, but one cannot point to any reaction that is wholly suppressed in consequence. It was once thought that nitrification ceased, but later work shows that this reaction, sensitive as it is, still goes on, although at a greatly reduced speed.

It has not yet been found possible to connect the change with the agent—to say at any given moment which organisms are playing the most important part at that time.

The obvious method of studying the changes in the soil is to observe the growth of plants, but the phenomena involved are too complex to be readily interpreted.

For our present purpose we can follow the changes in the soil by three methods:

(1) Measuring the rate at which oxygen is absorbed or carbon dioxide is given off by the soil.

(2) Measuring the rate at which ammonia or nitrate is formed in the soil.

(3) Estimating the changes in numbers of bacteria in the soil.

The first two can be determined as accurately as is desired, but the accurate estimation of bacterial numbers is not yet possible and the values are comparative only; nevertheless they are of considerable value for our work.

First of all we may take it as a general rule that the soil organisms, being living creatures, are dependent on suitable temperature and water supply, that they must have food, and also sources of energy to enable them not only to live but also to carry on those reactions which involve the accumulation of energy, or, in other words, resemble the rolling of a ball up a hill. These are general requirements that can safely be predicted of any living organism. In addition there is the special requirement that has been discovered by experiment: the need for calcium carbonate, without which many soil organisms will not act efficiently.

The application of general rules to soil problems is a very treacherous business; it is commonly the unexpected that happens, and experimental confirmation is therefore required at every stage. In order to get at the general nature of the effect of temperature and moisture content on the decomposition process it is necessary to do experiments in the laboratory, where all the conditions can be carefully controlled. Experiment shows that the effect of rising temperature on the bacterial numbers is quite different from what one expects: instead of rising, the numbers remain fairly constant up to about 80° F., and then they begin to fall.

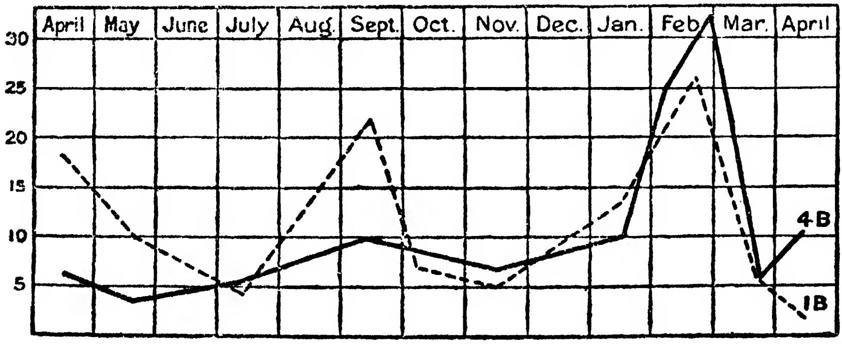


FIG. 61.—BACTERIAL NUMBERS IN SOIL AT DIFFERENT SEASONS OF THE YEAR.

[Plots 1B and 4B. Cropped with millet: unmanured. The curve showing moisture content is very similar to that for 4B (Conn.)]

In like manner, increases in water content of the soil do not lead to regular increases in bacterial numbers; there is a rise at first, but it is not sustained. So in natural conditions the numbers of bacteria do not show the expected fluctuations in the rise in temperature or moisture content. The discrepancy has been

traced to the circumstance that the soil population is complex and is not formed of bacteria only. The figures do not give the effect of temperature or moisture supply on the whole soil population, but only on part of it, and they indicate a competition or a destructive effect. When the soil population is simplified by killing the less resistant forms one obtains much more consistent results. Thus soil which has been treated with mild poisons such as toluene shows the expected increase in bacterial numbers with rise in temperature or moisture.

These facts, and others which need not now be dealt with, indicate that the soil bacteria are subject to the operation of some limiting factor quite distinct from temperature, moisture content, or food supply, and I have in other papers argued that this limiting factor is to be found in the action of some of the less resistant and larger forms, such as the protozoa, which keep down the numbers of the bacteria. This hypothesis explains all the facts that have yet been ascertained, but so many kinds of protozoa have now been discovered in the soil that it is difficult to pick out the exact offenders and render the hypothesis more precise from the purely zoological standpoint. We shall find, however, that the simplest way of interpreting the phenomena is to recognize the complex nature of the soil population and to admit the possibility of competition among them, just as one has to admit it in the case of any other population. We shall run into great difficulties if we make the common mistake of supposing that all soil organisms are there for the express benefit of our plants and our crops.

The amount of nitrate production does increase with the temperature, and in this respect it differs from the numbers of bacteria. This is in accordance with expectation ; up to a certain point an organism may be expected to do more work as the temperature rises, but the increase is not as great as one would get if the numbers increased as well (fig. 62).

When now we turn to the field conditions and try to follow the production of nitrate in the soil, matters are complicated by the fact that the nitrates produced do not all remain in the soil, but are liable to be washed out or taken up by plants. Analytical determinations, therefore, only give the difference between the amount formed and the amount lost ; they do not show how much is actually produced, nor give the rate of production that we desire to obtain. For some time we could see no way of getting over the difficulty, but a simple solution was ultimately found. It is evident that if the curves showing the amount of some other substance *produced in the same way as the nitrate, but lost in a different way,* are of the same general shape as the nitrate curves, then the shape is due mainly to the production factors ; if, on the other hand, the two sets of curves are different in shape, then the loss factors control the situation. The carbon dioxide in the soil air satisfies these requirements ; it is produced, like nitrates, by bacterial action, but it is lost largely by gaseous diffusion, and only in very wet weather by leaching. Carbon dioxide was therefore deter-

mined simultaneously with nitrates, and the curves show a marked similarity except that the increases in nitrate came later. Thus

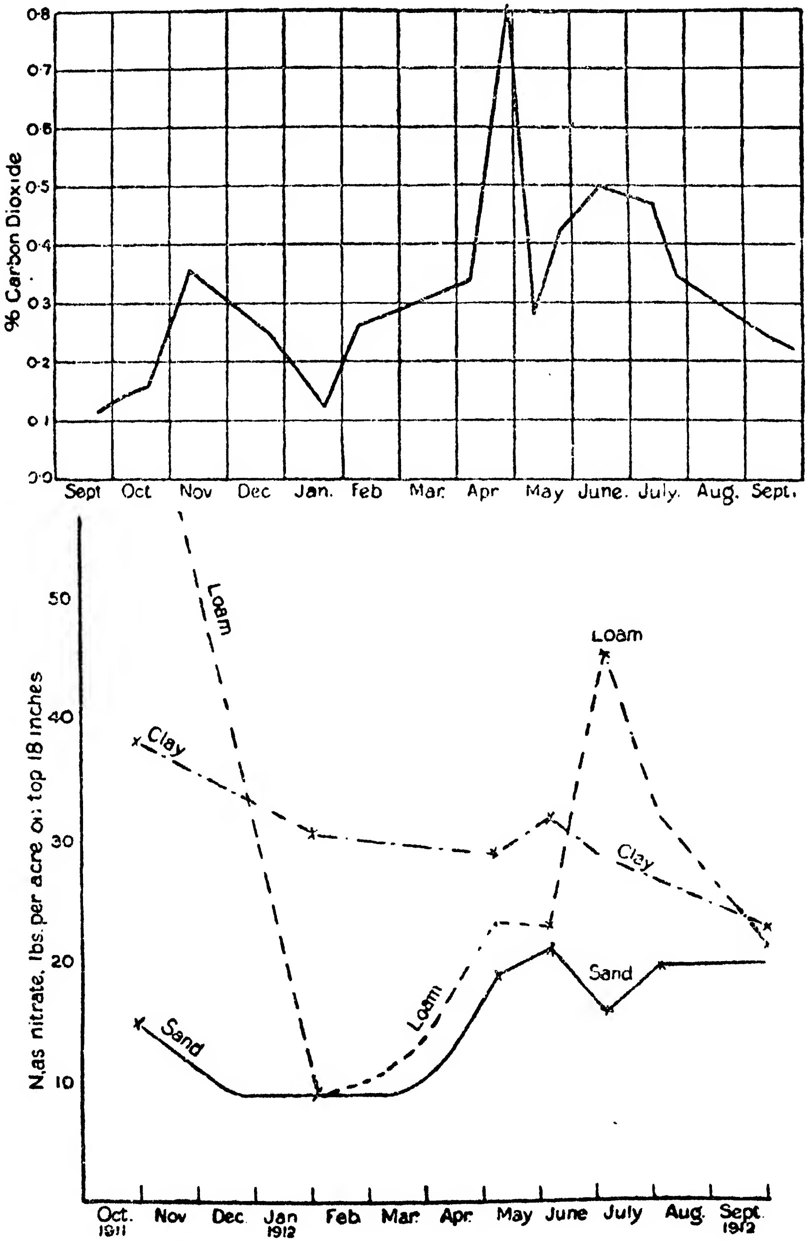


FIG. 62.—AMOUNTS OF CARBON DIOXIDE IN SOIL AIR, AND OF NITRATE IN SOIL AT DIFFERENT SEASONS OF THE YEAR.

we may conclude that the curves both for nitrate and carbon dioxide are in the main production curves (fig. 64).

The amount of carbon dioxide in the soil air, which, as we have just seen, indicates the rate at which it is produced, follows the soil temperature during the winter months, but not during the summer; indeed, during hot weather the amount is distinctly low (fig. 63). It does not

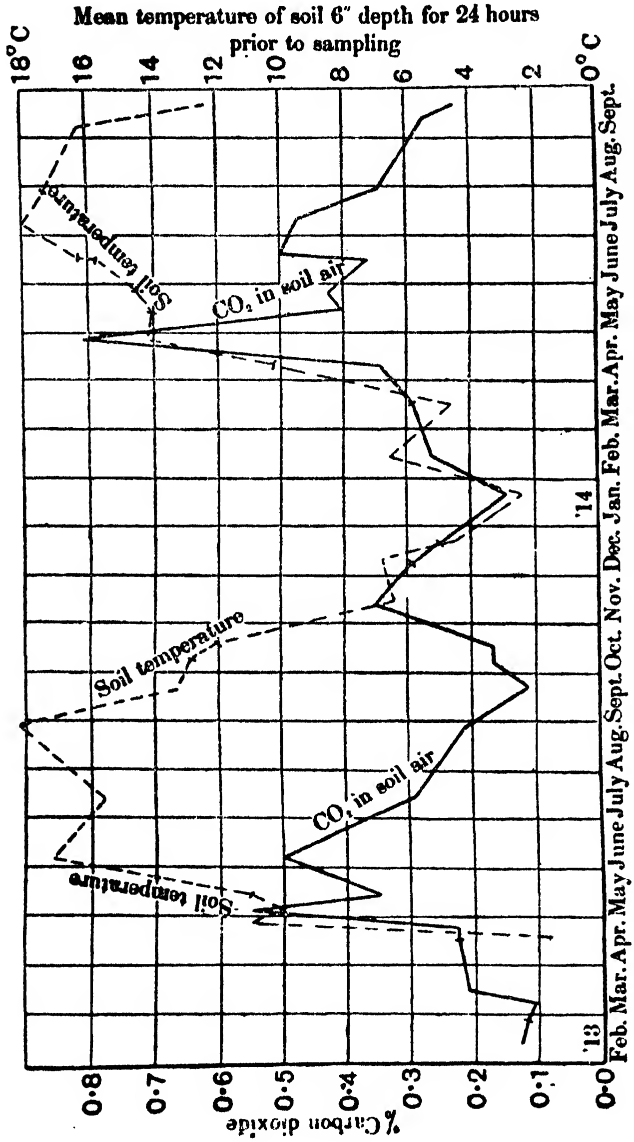


FIG. 63.—AMOUNTS OF CARBON DIOXIDE IN SOIL AIR IN RELATION TO SOIL TEMPERATURE.

show any very close connexion with the moisture content, but it is more closely related to the rainfall (fig. 64).

Thus it appears that rain does something more than add water to the soil, and an interesting problem is re-opened which has in the

past occupied a great amount of attention from agricultural chemists. From time immemorial practical men have felt that rain had a fertilizing effect. Medieval writers attributed it to some aerial spirit or celestial nitre washed down. Liebig, more precise, put it down to ammonia. As a result of Liebig's support a vast number of analyses have been made of rain from all parts of the world, but all agree in showing that there is not enough ammonia present to make any practical difference.

To what, then, are we to attribute this marked effect of rain? In soil investigations the direct attack is often least effective; it is usually necessary to work round the problem and see it from another point of view. In this case help came from a rather unexpected quarter. During the course of other soil investigations it was found that soil particles possess two atmospheres: the free atmosphere in the soil pore spaces, and another atmosphere dissolved in the soil water or soil colloids.

TABLE SHOWING COMPOSITION AND VOLUME OF SOIL AIR AND ATMOSPHERE.

	Per cent.		
	CO_2	O_2	N_2
Soil Air.			
Free air	0·4	20·3	79·3
Dissolved air	98·0	—	2·0
The Atmosphere.			
	0·03	20·97	79·0

The free atmosphere is very much like our own, except that it contains more carbon dioxide; it is eminently suitable for aerobic organisms. The dissolved atmosphere, however, is entirely different; it has not been fully investigated, but it is known to be almost devoid of oxygen and to consist mainly of carbon dioxide and nitrogen. The fact that it exists in such close proximity to the free atmosphere shows that the oxygen is used up more rapidly than it is renewed, and this means that the plant roots and micro-organisms which are immersed in the soil water are perpetually in need of more oxygen. So far as we know there is no process in the soil that will hurry up this renewal of dissolved oxygen, and plants and micro-organisms alike are perpetually restricted by the lack of it.

Now rain is a saturated solution of oxygen, and when it falls on the soil it not only supplies the needful water but also renews the stock of dissolved oxygen, and thus gives the micro-organisms and the plant roots a new lease of activity.

But the soil is not governed solely by the conditions that happen to obtain at the time being ; it is profoundly influenced by those that have passed ; indeed, one might go so far as to say that its properties are determined largely by its history. The shape, the size, and to a large extent the composition of the mineral particles are the result of forces that caused the fragments of rock to chip off long ages ago, and

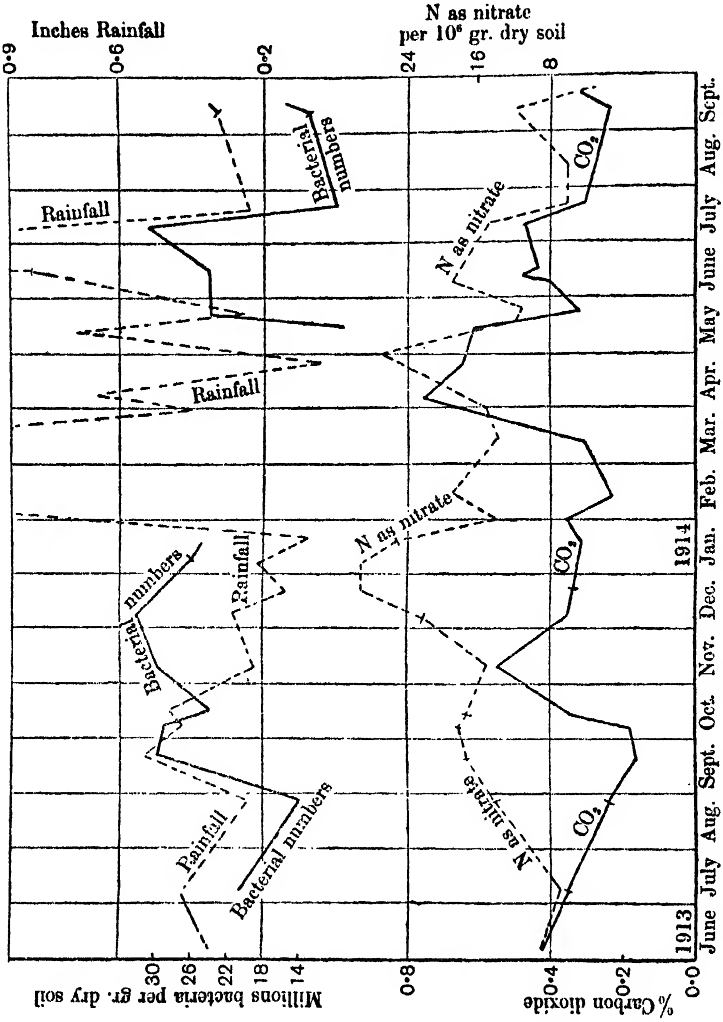


FIG. 64.—AMOUNTS OF CARBON DIOXIDE, NITRATE, AND NUMBERS OF BACTERIA IN RELATION TO THE RAINFALL.

have governed their wanderings ever since. The nature of the organic matter depends on the past vegetation, and this in turn on the climate ; the micro-organic population is determined by vegetation, climate, and other causes. The soil as we see it to-day is the result of changes and climates long since past as well as of those now present. In short, the soil is the embodiment of its past history, and can only be studied properly in the light of its history.

This is equally true of the minor events. Changes in conditions do not cease to be effective as soon as the old conditions are restored; they leave their mark, which may persist for a long time and lead to very unexpected results. Experiments at Rothamsted and elsewhere have brought out the apparent paradox that *conditions harmful to life lead to greater bacterial activity as soon as they have passed, while conditions favourable to life finally cause decreased bacterial activity.*

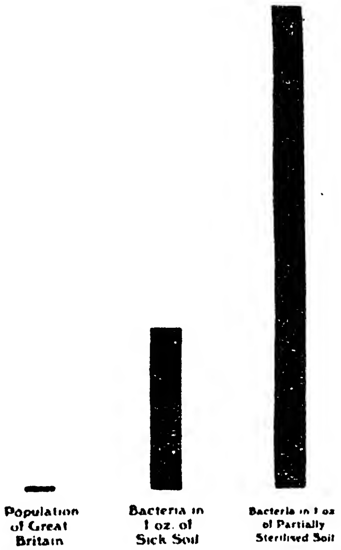


FIG. 65.—COMPARISON OF THE NUMBER OF BACTERIA IN SICK AND IN PARTIALLY STERILISED SOILS.

Thus, if a soil is dried for a time and then re-moistened, it becomes a better medium for the growth of plants and of bacteria, the production of nitrates is increased, and the supply of phosphate becomes more available. The bacterial numbers do not, however, undergo any visible change.

PRODUCTIVENESS OF SOILS STORED DRY.
(Oats: Gedroix, 1908.)

No. of years of Storage.	No Manure.	Complete Manure.	Complete without Nitrogen.	Manure without Phosphate.
0	10·3	83·5	13·5	11
1	17·8	83·9	32·3	19
3	24·6	90·9	23·6	35·4
5	25·0	102·8	32·2	42

When soil is exposed to severe cold there is an increase in nitrate production, and, in this case, in bacterial numbers also. Exposure to

heat causes a similar change. Greater growth is commonly obtained wherever a bonfire has been made, and in India it has been the practice from time immemorial to heat the surface of the land before growing the rice crop. Volatile antiseptics are now known to have a like result.

The converse of the rule is also true: whenever a soil is well supplied with organic matter, with moisture, and kept well warmed, the bacterial numbers do not remain as high as might be expected, but on the contrary they tend to come down. After a time these soils fail to produce their full effect and they are said to become "sick." Instances occur in commercial glasshouses run at a high temperature where the soil after a season's use becomes unsuitable and is therefore thrown out, all its valuable manurial residues being sacrificed (fig. 65).

Sick soils have been examined in some detail, and the trouble was traced to at least two causes: an accumulation of disease organisms, and also an exaggerated activity of the factor limiting bacterial activity in ordinary soils.

These phenomena afford further evidence of competition among the soil organisms, and indicate that some of the groups, and especially those which are fairly readily killed, are detrimental to the useful soil bacteria.

Some of these changes affect the soil itself. The jelly-like substances—the colloids—shrink on drying, and may conceivably expose fresh particles of organic matter to the action of the organisms or liberate some of the phosphates they had absorbed. So also intense frost may split up some of the undecomposed organic matter and facilitate the work of the micro-organisms.

These observations throw important light on the effects of season and climate on the production of nitrate in the soil. It is notoriously difficult to generalize about seasonal effects, but as a general rule the activity of micro-organisms is greatest in late spring and in autumn, and lowest in summer and winter.

The winter minimum is easily intelligible: the low temperature limits the activities of the organisms, and, as we have already seen, any rise in temperature immediately evokes a response, so that the curves for the production of carbon dioxide run closely parallel to the temperature curve.

The spring maximum is remarkably interesting. It begins to show itself when the soil is drying after the cold and wetness of the winter, and when the sunny days first cause the temperature to rise. But it is the rain coming after warmth that causes the rush of life. Three factors seem to be involved. During winter the cold and the general unfavourable conditions have had their partial sterilizing effect on the soil population, and also have resulted in a certain amount of disintegration of the soil organic matter. Everything is therefore ready for a great outburst of activity.

But in our climate this does not come suddenly. Before the soil can become warm it has to dry, and by the time it is warm enough for

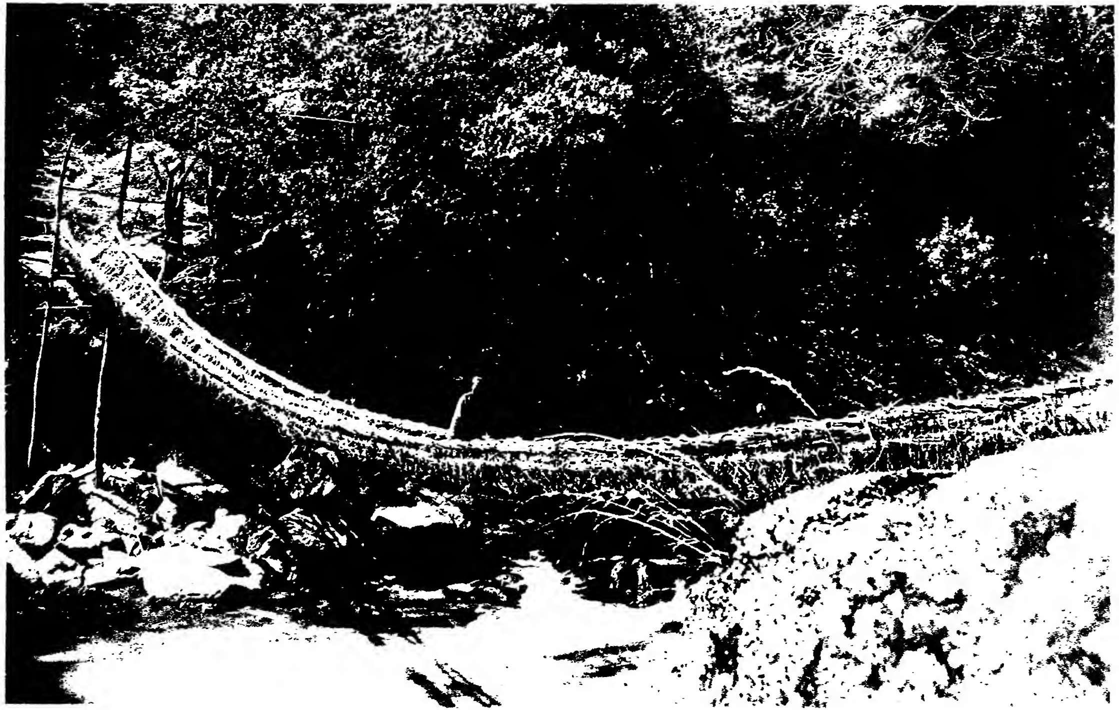


Fig. 66.—A Bridge of Lianas in N.W. Yunnan, looking up stream.

[*To face p.* 196.

FIG. 67.—A BRIDGE OF LIANAS IN N.W. YUNNAN, LOOKING ACROSS STREAM.

FIG. 68.—RHODODENDRON BULLATUM.

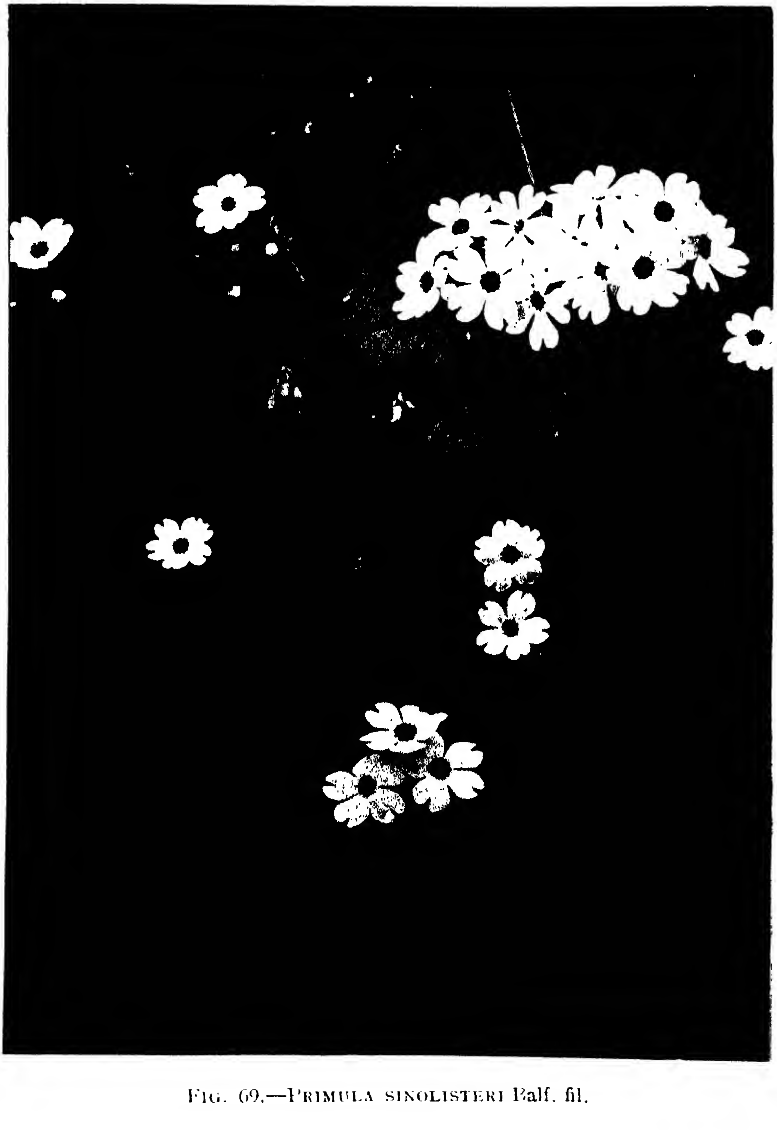


FIG. 69.—PRIMULA SINOLISTERI Balf. fil.

[To face p. 19?.

much bacterial action the chances are that it has dried too much. It is therefore necessary to wait for rain to supply the needful water and renew the dissolved oxygen in the water round the soil particles. It is this combination of temperature, moisture, and oxygen supply, following on the beneficent changes effected in the winter months in the soil organic matter and the soil population, that causes the great outburst of soil life in the spring.

The explanation is new, but the facts have long been known to all observers.

Spring has always been recognized as the great time for life in the soil. "It is then," says Virgil, "that Aether, the Almighty Father of Nature, penetrates the womb of earth with his fruitful showers and, blending his mighty frame with hers, gives life to all the embryos within." *

The summer minimum may be attributed to dryness, and the autumn maximum to a repetition of the spring effects. In a moist warm summer, however, continued activity may occur right up to the point when "sickness" sets in, and the autumn maximum may not then arise.

In consequence of these various activities the soil is left pretty rich in nitrates at the end of the autumn provided the summer has been reasonably dry. If these remain they form a good supply for the young plants of the following season. But in a wet winter part is washed out and the young plant is deprived of some of its food. We thus have part of the explanation of the harmful effect of a wet winter, and one of the reasons why the husbandman in all ages has hoped for dry winters. "A wet summer and a fine winter," to quote again from the Georgics, "should be the farmer's prayer. From winter dust comes great joy to the corn, joy to the land. No tillage gives Mysia such cause for boasting, or Gargarus for wondering at his own harvest."† English farmers would ask for the wet spring instead of the wet summer, but they would agree entirely as to the winter, and out of their experience they have evolved a variety of similar expressions. Again the man of science has annotated the poet, and Sir William Shaw has worked out a mathematical expression showing how much damage is done on an average by winter rain.

The trouble can be met by a system of green manuring, whereby plants are grown in the autumn to take up the nitrates and are then ploughed into the land ready for the operation of the soil organisms in spring. The system is very sound, and as soon as it is sufficiently

* "Vere tument terrae et genitalia semina poscunt.
Tum pater omnipotens fecundis imbribus Aether
Coniugis in gremium laetae descendit, et omnis
Magnus alit magno commixtus corpore fetus."
Georgics, Bk. II. ll. 324–327.

† "Umida solstitia atque hiemes orate serenas,
Agricolae; hiberno laetissima pulvere farra,
Laetus ager: nullo tantum se Mysia cultu
Iactat et ipsa suas mirantur Gargara messes."
Georgics, Bk. I. ll. 100–103.

developed to fit in with our present rotation it may be confidently expected to play a considerable part in helping the farmer to struggle against bad weather.

TABLE SHOWING THE EFFECT OF WET AND DRY WINTERS RESPECTIVELY ON THE YIELD OF CORN AT ROTHAMSTED.

—	Rainfall October–March.	Yield of grain, bushels to the acre.		
		Ammonium Salts applied.		Difference in favour of Spring dressing.
		In Autumn.	In Spring.	
[1] Dry winter .	11·73	31·8	32·5	0·7
[1] Wet ,, .	16·73	27·5	32·5	5·0
		Total produce (grain and straw), lb. to the acre.		
Dry winter .	11·73	5,631	5,829	196
Wet ,, .	16·73	4,932	6,004	1,072

[1] The dry winters were those preceding the harvests of 1889, '90, '91, '93, '98, 1901, '02, '03, '05, '06, '09, for which the results are averaged here; the wet winters were those preceding the harvest of 1892, '94, '95, '96, '97, 1900, '07, '08, '10, '11.

We must now leave these interesting weather problems, and turn to the other factors affecting the activity of the soil bacteria.

Calcium carbonate is absolutely essential to the activities of soil bacteria, and the soil is not a good medium for bacterial activity until it has adsorbed or combined with as much as it can. It is impossible to say why: one can only state the fact, and in the expressive language of the practised man say that the soil is "sour." Either calcium carbonate or calcium oxide (quicklime) may be used, and for long it was supposed that both acted in substantially the same manner. Dr. HUTCHINSON has recently shown, however, that there is a fundamental distinction between the two, in that quicklime is a partial sterilizing agent having the same effect on soil as any other partial sterilizing agent, causing first a depression and then an increase in bacterial numbers and in ammonia production, while chalk has no such effect.

It is often said that the value of calcium carbonate is to neutralize acids which would otherwise form in the soil, and there is some probability, although little evidence, for the supposition. Organic acids may be formed in the decomposition processes, and we know that practically all calcium salts of organic acids decompose without difficulty with re-formation of calcium carbonate. It is possible, therefore, that the carbonate plays as it were the part of a lubricant coming into the cycle to help over a difficult stage.

It has also been asserted that toxins are present in the soil which after a time stop the further action of the organisms. There is no evidence of this, excepting that most dangerous argument of

all—the argument from analogy. When a bacterial culture is made on an artificial medium in the laboratory the organisms go on developing for a time and then stop, being brought to a standstill by an accumulation of decomposition products with which they cannot deal. It is argued that the same thing must go on in the soil, and that the accumulation here must have a toxic effect just as it does in the artificial culture.

There is, however, this fundamental distinction between the laboratory culture and the soil. In the laboratory culture the medium is made up to deal with one class of organisms only; as soon, therefore, as substances accumulate which this class cannot decompose the whole action automatically comes to an end. But in the soil there is a great variety of organisms capable of attacking a considerable variety of organic substances: so great indeed that it is difficult to understand how any intermediate decomposition product could accumulate sufficiently to interfere with bacterial activity. The final product of all—the nitrate—is so easily washed out from the soil that it rarely, if ever, accumulates under normal conditions.

The argument in favour of bacteriotoxins deduced from the analogy of laboratory cultures is therefore devoid of foundation, and we must rely simply on the direct experimental evidence. Of this there is practically none, all sound experiments giving negative results. Negative evidence is notoriously unsatisfying, but until some positive evidence is forthcoming we cannot suppose that bacteriotoxins play any notable part in the soil.

There is, however, considerable evidence that the growing plant exerts a depressing effect on the soil organisms. Rigid comparisons are not easy, but when the conditions on a fallow plot are made to approximate as closely as is possible to a cropped plot it is found that there is more activity on the fallow plot.

This has been observed at various places: at Rothamsted, at Ithaca, at Pusa and elsewhere in ordinary arable soils, and it was noticed by HARRISON in his studies of paddy soils. It is not clear from the experiments how the action takes place: whether the plant simply exercises some indirect action on the temperature or moisture supply, or whether it directly affects the soil organisms. On the whole the evidence rather tends to indicate a direct action such as might be brought about by some poison given off from the root or left by the plant, or such as would result from the removal by the plant of some substances necessary for the bacteria.

Further experimental work is in hand on this matter. The effect of the plant on soil bacteria recalls the remarkable effect of one growing crop on another observed by Mr. PICKERING. It is obviously impossible to say that these effects are identical, but we may reasonably hope that the further investigation of each of these problems will throw helpful light on the other.

THE FLORA OF NORTH-WESTERN YUNNAN.

By George Forrest.

[Read July 20, 1915; Mr. E. A. Bowles, M.A., F.L.S., in the Chair.]

The flora of North-Western Yunnan is now admitted to be one of the richest in the world, and the most likely to supply us with garden novelties for many years to come. The region explored, during seven or eight years' journeying in the province, is essentially alpine, and, though shrubs do not bulk so largely as in others from Central China, my collections hold a greater number of herbaceous perennials admirably suited for alpine gardens.

The formation of the ranges explored, composing the watersheds of the Salween, Mekong, and Yangtze valleys, is principally limestone. In the lower valley levels are clay, sandstone, and shale belts, but the caps of the mountains are hard flinty lime, and on that the cream of the flora is invariably found.

Entering China from Bhamo, there is an easy ascent of 130 miles to Tengyueh, where an altitude of 5,500 feet is attained. That district, though geographically in the basin of the Irrawaddy, may be considered as the commencement of the great Yunnan plateau which descends from the Eastern Himalayas and gradually loses itself in Szechwan and Yunnan.

Around Tengyueh the country is volcanic, hot springs abound, and there are numerous lava-beds, each many miles in extent, the overflow of extinct volcanos. On those beds the richest flora is established, but the region is almost subtropical, and there is therefore small hope of anything from the locality proving altogether hardy with us here. True, there is at times as much as sixteen degrees of frost registered, and occasional slight falls of snow, but during the winter the atmosphere is extremely dry, and that nullifies the effects of the cold.

There are few Rhododendrons, the principal being *Rhododendron ciliicalyx* Fr. and *R. oxyphyllum* Fr. *R. racemosum* Fr., the most abundant of all species on the uplands of Yunnan, is not found so far west. On the lava-beds *Ilex Pernyi* attains perfection, and, in places, is the dominant shrub, forming considerable thickets. Individual specimens have the symmetrical form of growth seen in cultivation, and reach a height of 18 to 20 feet. There is considerable variation in the form of foliage. Another superb evergreen shrub, found in similar situations, is *Lonicera Braceiana*. The foliage is almost coriaceous, dark glossy green; the flowers are produced in

profusion, and are much the same shades as those of our indigenous species, but more strongly fragrant. The corollas are 5 to 7 inches in length.

Primula sinomollis Balf. fil. and *P. helodoxa* Balf. fil. are two of the finest new species of the region. The latter is a marsh plant of strong growth, with bold foliage and numerous whorls of large rich yellow blooms; it grows in heavy clay ground, often in company with *P. Poissoni* Fr. *P. cinerascens* Fr., a shade-loving woodland species with rose-coloured flowers, is also found on the surrounding hills. The finest species of the genus found there is *P. pseudomalacoides* Stewart. It might be termed the western form of the *malacoides* type, which is common further to the east. It differs from the true *P. malacoides* in having coarser foliage, much stiffer scapes, and more numerous and larger flowers. It affects shady situations on the margins of open thickets, loves a free soil, and is a winter-flowering plant, at its best in January and February.

The country between Tengyueh and Talifu, fully 200 miles in extent, is a rolling plateau, rising in parts to nearly 11,000 feet, and intersected by the deep valleys of the Salween and the Mekong and their tributaries. The summits of the ridges are more or less densely clothed with pine and mixed forests, especially on their northern aspects, thinning out to heavy thickets of shrubs on their lower slopes. In the shadier and drier situations *Rhododendron Viali* Fr. and *R. formosum* are seen to perfection; in the more open places, forms of *R. Fortunei.*

Many species of Clematis abound, the most common being *Clematis Armandi*, *C. fasciculiflora*, *C. nutans*, forms of *C. montana*, and, in the driest and sunniest situations, the beautiful *C. chrysocoma*, than which, with its soft rose-coloured flowers and golden, glistening foliage, none is more beautiful. One of the finest new species found is *C. Forrestii* Smith. This is a scandent shrub of 20 to 30 feet in height. The foliage is finely cut and ornamental, the flowers pendulous on long pedicels in axillary clusters of five to six. Each is nearly an inch in diameter, the perianth a soft, creamy yellow, with anthers and filaments a brilliant shade of rose-magenta. The combination reminds one of the coloration of *Anemone Pulsatilla.* It is as striking a species in fruit as in flower, the achenes being densely clothed in heavy, glistening hairs.

On the more open hillsides are a multitude of dwarf shrubs, the principal genera represented being *Rubus, Dipelta, Viburnum, Spiraea, Philadelphus, Deutzia, Styrax, Illicium, Ligustrum, Berberis, Coriaria, Buddleia, Benthamia, Kerria, Camellia, Magnolia, Hydrangea,* &c. One of the most striking species is *Dichroa febrifuga*, with its deep purple-blue flowers and indigo-coloured berries.

Much of the grassland, especially where marshy or moist, for the duration of the season is ablaze with a wealth of herbaceous plants, such as Anemones, Primulas, Gentians, *Corydalis, Pedicularis,* Spiraeas, Senecios, Potentillas, and Asters.

On the highest limestone peaks of the Shweli-Salween divide,

which is the most prominent range on the route from Tengyueh to Tali, a flora is found much akin to that of the Lichiang and higher ranges in the extreme north-west. To take Rhododendron alone, such species as *R. Souliei*, *R. sulfureum*, *R. crassum*, *R. bullatum* (fig. 68), *R. trichocladum*, *R. neriiflorum*, *R. campylogynum*, and *R. lacteum* var. *macrophyllum* are common to both; as well as many shrubs of other genera, and numerous alpines.

As the western slopes of the Tali range are approached the character of the flora changes, becoming distinctly more alpine. *Rhododendron ciliicalyx* in many places covers the hillsides with masses of blooms, and there, also, is found a very tall-growing and free-flowering form of *R. racemosum*. Another Rhododendron, a new species, as yet unnamed, is more rare. It is an ally of *R. ciliicalyx*, but quite distinct from that species, with bolder foliage, more symmetrical and compact in form, and producing a greater number of larger flowers. These are sweetly and strongly fragrant, in colour white, shaded rose on exterior, with a blotch of bright lemon-yellow on the base of the interior.

Here is first met *Primula sinolisteri* Balf. fil., a plant difficult to place in the genus. It might pass equally well as the extreme western type of *P. obconica* or the eastern form of *P. Listeri*. The blooms range from rose-lilac to the purest white. It is a beautiful species and well worthy of cultivation (fig. 69).

At the extreme southern point of the Tali range the route turns north, leading through the Tali valley, between the base of the mountains and the beautiful Tali lake on the east. The altitude of the plain is 6,500 feet, only 1,000 feet more than Tengyueh, but, lying so much to the east and north, and with the proximity of such a huge range, the climate is more rigorous. The winter is quite severe; for at least four months of the year the snows descend to about 1,000 feet above the valley, occasionally even that is coated for days, and the atmosphere is dry and frosty. In summer the rainfall is fairly heavy, though there is no excessive heat.

The range stretches north and south for some seventy miles, and, with the exception of one or two small peaks, rises to a uniform height of about 14,000 feet. In the north it tapers off into the numerous broken ranges which form the eastern watershed of the Mekong. The eastern flank of the range is scored from base to summit with numerous deep gorge-like lateral valleys, almost all of which carry a flora peculiar to themselves. The lower slopes have been denuded of timber, even brushwood, by the inhabitants of the valley for domestic purposes; the middle slopes are heavily clothed with mixed and pine forests, whilst the gorges are almost closed with dense undergrowth of shrubs.

This area was the scene of Père DELAVAY's labours, and will always be associated with his name.

The cliffs, ridges, and the higher alps are the homes of many fine species of Primula. In the valley itself *P. malacoides* flowers to

perfection, both in the open and shade, during the coldest term of the year. Along the base of the range, the banks of every stream and the margins of every marsh are brightened with the velvety crimson flowers of *P. Poissoni*. On the lower slopes and in the gullies, humus-covered rocks and ledges of shady cliffs are clothed with *P. sinolisteri* and masses of the bright green foliage and delicate rose-coloured blooms of *P. membranifolia* (fig. 70), whilst at a higher altitude and in like situations is found an equally graceful rock species, *P. yunnanensis* Fr. At 10,000 feet, in the shadier thickets the beautiful *P. septemloba* Fr. is one of the commonest plants, while 1,000 or 1,500 feet higher, on the margins of pine forests, *P. serratifolia* Fr., with its pendulous, orange-lined, yellow blooms, is found.

About the same altitude, on dry exposed rocks, is found the beautiful new species of the Bullatae section, *Primula coerulea*. This is one of the rarest species met with in the province. Here also, on the dry rocky slopes, growing amongst limy grit at the base of cliffs, is the most beautiful species, in my opinion, of all known Primulas, *P. spicata* Fr. None can compare with this species in airy gracefulness or in rich colouring, the azure-blue flowers forming a wonderful contrast to the silvery farina with which the plant is coated. The scapes are so slender that they seem scarce able to bear the weight of the relatively large flowers, which the slightest current of air sets trembling and swaying, much in the manner of some of the Campanulas.

On the highest alps of all grow two of the most interesting species, *Primula bella* Fr., which forms moss-like masses of minute crisped foliage, studded over with large deep rose blooms borne on delicate scapes only an inch in height; and *P. Delavayi* Fr., the most southern member of that curious group of which, as yet, only four species are known to exist, the Omphalogramma section. *P. Elwesiana* is the representative from the Himalayas; the others, *P. Franchetiana* and *P. vincaeflora*, are found north of Tali, on the Mekong and Lichiang ranges respectively. *P. Delavayi* is the least interesting and beautiful of the three, but is unique in having the margins of the corolla lobes heavily fringed. *P. amethystina* Fr. and *P. brevifolia* Forrest, two lovely species of the Soldanelloid type, with deep purple-blue flowers, are met with on the same meadows as the above.

Two further excellent species of the same section, both showing the beautiful contrast in colour seen in *P. spicata*, are natives of the more southern portion of the range. These are *P. nutans* Fr. and *P. penduliflora* Fr.; both are in cultivation from seed secured in 1913–1914. Besides all those lovely species of Primula, the Tali range is the home of numberless plants of intense interest, both botanical and horticultural. There Père DELAVAY first discovered *Paeonia lutea*, and, no doubt, the seed which produced the specimens now in cultivation came from there, though, since that time, the species has been found much further north.

For horticulturists, however, the real wealth of the area is centred

in the Rhododendrons; most of the finer species of the genus discovered by DELAVAY are indigenous to the range; in the gullies and gorges one comes on them at every turn, either as solitary specimens or in groups, sheltered and supported by a jungle of mixed scrub and cane. In shady places, such species as *R. neriiflorum* and *R. haematodes* eclipse everything in beauty with their cherry-coloured and deep crimson blooms, whilst again, beneath their shade, is found the dwarfest of all known species from the region, *R. campylogynum*, only a few inches in height, with pendulous, dark plum-purple, bell-like corollas. *R. brachyanthum* is another dwarf with dull greenish-yellow flowers of similar shape and substance. *R. bullatum* is also partial to shade, and is found in company with the above, but is never so abundant though more widely distributed. It is a real rock shrub, and its large fragrant white blooms are most ornamental (fig. 68).

Other species, growing more in the open, are *R. ciliicalyx*, with flowers white, flushed rose on exterior, and *R. crassum*, both as rock plants. *R. racemosum*, *R. oleiifolium*, *R. microphyton*, *R. trichocladum*, *R. rigidum*, and *R. aureum* are, more or less, grassland plants, and are found in open and drier situations.

At higher altitudes, forming open thickets and even forests, are found the taller species, as *R. Delavayi*, *R. irroratum*, *R. decorum*, *R. taliense*, *R. yunnanense*, *R. rubiginosum*, and *R. cyanocarpum*, whilst highest of all, carrying the genus up to the extreme alps, is *R. sulfureum*, and many delightful forms and species of the *R. fastigiatum* and *R. intricatum* groups. Since the days of Père DELAVAY'S collecting many excellent new species have been added to the list, as *R. dichroanthum* Diels, with large, deep red-orange blooms; another species, as yet unnamed, with large compact trusses of canary-yellow flowers, a tree species after the style of *R. Wightii*; *R. Beesianum*, *R. Balfourianum*, *R. prostratum*, &c.

Recently there has been much discussion regarding lime and Ericaceous plants, especially as applied to the cultivation of Rhododendrons. As already mentioned, most, if not all, of the mountain ranges of W. and N.-W. Yunnan are solely limestone formations, and it is on those the greater number of the Rhododendrons are found. I am not in a position to give a decided opinion, but this I can state positively, that most of the Rhododendrons I have collected in that region grow directly in, or on, pure limestone. Many of the smaller shrubs, such as *R. neriiflorum*, *R. floccigerum*, *R. sanguineum*, *R. bullatum*, *R. ciliicalyx*, *R. crassum*, *R. yunnanense*, *R. aureum*, &c., and the dwarf species *R. campylogynum*, *R. brachyanthum*, *R. trichocladum*, and forms of *R. intricatum*, have their roots embedded in the crevices of the limestone rocks or cliffs, or in the limy rubble at their base; whilst the taller tree species, though with more or less of a bed of humus for support, have their smaller roots similarly placed.

Even the lower-level species, such as *R. rigidum*, and forms of

FIG. 70. PRIMULA MEMBRANIFOLIA.

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FIG. 71.—OAK FOREST AND MEADOW COVERED WITH RHODODENDRON INTRICATUM IN FOREGROUND. SUNG-KWEI PASS, N.W. YUNNAN. 12,000 FT. ALTITUDE.

FIG. 72.—LICHIANG PEAK FROM THE SOUTH

FIG 73. ACONITUM FORRESTII IN THE LICHIANG RANGE.

Fig. 74.—Primula lichiangensis.

FIG. 75.—PRIMULA BEESIANA.

FIG. 76.—A GROUP OF PRIMULA LITTONIANA.

FIG. 77.—A SINGLE PLANT OF PRIMULA LITTONIANA.

[To face p. 205.

R. racemosum, &c., are seen at their best when in a soil largely composed of limestone rubble, or a strong, red limy marl. From these points it is natural to conclude that, in some form, lime must be absorbed by the plants, and is therefore necessary for their best development.

The country between Talifu and Lichiang, though mountainous to a degree, is, nevertheless, a dry area. This is probably caused by the huge bulk of the Tali range acting as a rain-screen in the S.W. The plains are well irrigated by streams which mostly have their origin beneath the mountains, but on the alps long barren stretches of limy grassland are frequent. The region is volcanic, and here again, as at Tengyueh, hot springs abound. The most prolific of the intervening ranges is that forming the watershed between the valleys of Lang Kong and Hoching. There also DELAVAY did some collecting, *Primula pulchella*, *P. malvacea*, *P. vincaeflora*, *P. bullata*, *P. rufa*, and *P. blattariformis* being the best of his finds.

The Sung-kwei pass (fig. 71), one of the least frequented between those two valleys, is of most interest from the extensive Rhododendron forests covering many miles of the summit. Nowhere in Yunnan, not even in the more prolific regions of the N.W., is there such a display of bloom during the months of April and May. Forests of tree Rhododendrons, comprising fully a dozen of the finer species, are flanked and backed by moors and meadows which are literally carpeted by masses of dwarf cushion species, bearing flowers of every imaginable shade, from the deepest purple to the palest lilac-blue.

Though Père DELAVAY did not collect on the Lichiang range himself, through collectors employed by him he secured much that was good, but only of those species found at the lower altitudes. It was left to those who followed to skim the cream of the flora nearer the top.

The plain, descending from the southern base of the range to the col separating the Lichiang from the Hoching valley, is of 8,200 feet altitude, and has, unquestionably, at one time been a lake. The whole formation is purely lacustrine, varying in depth from a few to fully 100 feet. The main streams irrigating the lower levels of the valley, and which originate on the mountain flanks, disappear at the base, reappearing towards the centre of the plain. Owing to this, the northern portion is of a most barren nature. The vegetation is mostly xerophytic, consisting chiefly of a stunted form of evergreen spinous-leaved oak. There are also patches of *Eriobotrya prionophylla*; and in the gutters and water channels worn by the summer rains is found a scanty mixed scrub composed of *Philadelphus* sp., *Deutzia* sp., *Lonicera Mackii*, *Indigofera pendula*, *Berberis* sp., *Wikstroemia* sp., *Viburnum* sp., *Rhamnus* sp., *Ligustrum ionandrum*, *Corylus* sp., &c., all much stunted. The herbaceous vegetation consists, principally, of many species of the least succulent grasses. There are many large stretches covered, to the exclusion of all else, with *Spenceria ramalana*, a striking plant when growing in masses, a few dwarf Anemones, Gentians, *Pedicularis*, Campanulas,

Ainsliaeas, Leontopodiums, *Anaphalis*, *Arabis*, various Umbellifers, Asters, Dracocephalums, several Saussureas, the most interesting being *S. romuleifolia*; *Oxyria sinensis*, *Lactuca napifera*, and a very dwarf form of *Androsace spinulifera* Fr. In the last the scapes are only 2 to 4 inches in height, whilst the foliage is reduced to extremely spinous scales forming a ball-like rosette.

However, the bleakness and barren nature of the plain is compensated by the prodigality of the mountain. From the base to the limit of vegetation at 17,500 feet, the range in its whole extent of fully fifty miles is one huge natural flower-garden. The extreme height of the range is almost 20,000 feet; there is therefore about 3,000 feet of perpetual snow (fig. 72).

From 8,500 to 10,500 feet there is a belt of arborescent vegetation, rich in trees and shrubs of many of the finer genera, as *Tilia*, *Acer*, *Prunus*, *Sorbus*, *Cotoneaster*, *Philadelphus*, *Meliosma*, *Deutzia*, *Berberis*, *Lonicera*, *Euonymus*, *Buddleia*, *Hydrangea*, *Jasminum*, *Helwingia*, *Wikstroemia*, *Leptodermis*, *Clematis*, *Lespedeza*, *Piptanthus*, *Bauhinia*, *Gaultheria*, *Vaccinium*, and many of the lower-level Rhododendrons.

The conifer belt extends from 10,500 feet to fully 14,000 feet, and runs the full length of the range. At the lowest level it consists chiefly of species of *Pinus*, the graceful *P. Armandi* being much in evidence in the most sheltered situations; and higher, *Tsuga yunnanensis*, several species of *Picea*, *Abies Delavayi*, and *Larix tibetica*. The last species forms forests many miles in extent on the most northern portion of the range. Up to this line there is a dense growth of interesting and beautiful under-shrubs many of them Labiates, whilst in the more open forests and glades some of the finer lower-level herbaceous plants are found, as *Incarvillea brevipes* and *I. lutea*, *Anemone rupicola* and *A. demissa*, *Roscoea cautlioides*, *Strobilanthus versicolor*, *Aconitum Forrestii* (fig. 73), *A. transsectum*, *A. brevicalcaratum*, and *A. venatorium*, *Polygonum lichiangense*, *Cypripedium luteum*, *C. tibeticum*, and *C. margaritaceum*, *Delphinium Delavayi*, *D. Bulleyanum*, and *D. yunnanense*, *Hemerocallis* sp.; and a number of Liliums, including *Lilium Thomsonianum*, *L. giganteum*, *L. Dalavayi*, *L. ochraceum*.

Many portions of the eastern flank of the range are weathered away to a series of gigantic graduated cliffs, every ledge a gleaming patchwork of colours, but, alas! quite inaccessible. Portions of those, explored at great hazard, yielded such spoil as *Primula Forrestii*, *P. lichiangensis* (fig. 74), *P. rufa*, and *P. kichanensis*, *Campanula crenulata*, and *Dracocephalum bullatum*.

On the moister meadows along this belt, and in the shadier openings of the forests, are the homes of such lovely plants as *Primula Bulleyana*, *P. Beesiana* (fig. 75), *P. Wardii*, *P. vincaeflora*, *P. Littoniana* (figs. 76, 77) and *P. pulchella*. Of Meconopsis are found *Meconopsis Delavayi*, *M. Forrestii*, *M. concinna*, *M. venusta*, and *M. integrifolia*. In the most boggy situations, *Rheum Alexandrae* grows; and

on the ledges of limestone cliffs and the stoniest situations on the open slopes the beautiful *Daphne aurantiaca*. This is one of the most free-flowering of all shrubs of North-West Yunnan.

The cream of the flora, however, is on the alpine pastures and the many and enormous screes which lie from 14,000 feet to the limit of vegetation. There is seen a wealth of species, possibly equalled, but nowhere surpassed, in any of the regions of Yunnan hitherto explored. Many more species of Primula are found, for this range alone produces fully forty! Compositae are strongly represented, as well as Ranunculaceae, Gentianaceae, Cruciferae, Campanulaceae, Saxifragaceae, and Ericaceae, and many peculiar species of Rhododendron occur. Of Primulas, all of which are meadow plants, there are *P. pseudo-sikkimensis* (fig. 78), *P. secundiflora* (fig. 78), *P. sinopurpurea*, *P. pinnatifida* (fig. 78), *P. sonchifolia*, *P. brevifolia*, *P. incisa*, *P. gracilenta*, *P. florida*, *P. Giraldiana*, *P. calliantha*, and the wonderful *P. dryadifolia* Fr. As the specific name implies, the last has foliage similar in form to that of *Dryas*, bright green above, the under-surface heavily coated with a dense sulphur-tinted farina. The flowers are produced freely, are of large size, on short stout scapes of 2 inches, two or three blooms to each, in colour bright rose-lake with an orange eye; the bracts large and deep purplish-crimson. The species forms cushions 2 feet or more across, and grows in the most barren exposed places on limestone rubble and screes at 16,000 to 16,500 feet altitude. It is the last Primula met with in those parts (fig. 79).

Of Compositae, there are many fine Lactucas, all scree plants, such as *Lactuca Souliei*, with ruddy brown foliage and brilliant blue flowers. *Crepis rosularis*, with deep golden heads, and *C. umbrella* with larger and lighter-coloured ones, are also scree plants of similar habit. *Cremanthodium* is another genus represented by a number of beautiful forms, the finest being *C. nobile*, with golden-yellow fragrant blooms 3 to 4 inches in diameter. *C. campanulatum* has dull deep crimson flowers, whilst those of *C. rhodocephalum* are grey-pink and rose. Of Asters the finest is a half-shrubby species, *Aster staticifolius* Fr., the ray florets of which are bright purplish-blue, with orange-coloured disc florets. Each head is almost two inches across, and I have counted as many as 300 on one plant! It is a rock plant. *A. Delavayi* is another fine, but biennial, species, with very large flower-heads. *A. brachytrichus* is a woodland species, with very richly coloured blooms; and on the highest alps is found the beautiful dark-flowered dwarf, *Aster lichiangensis*. Saussureas are legion. Many of them are very beautiful, but the most interesting are *Saussurea gossypiphora* and *S. leucoma*. Both are alpines, and armed in like manner against the rigorous Yunnan winters they have to endure at those extreme altitudes, the plants being smothered in masses of glistening cottony down. *S. leucoma*, the smaller of the two, is found at the lower altitudes, where less protection is necessary, and it is the less cottony; but *S. gossypiphora* grows at the highest altitudes, and, at a short distance, individual plants resemble balls of greyish-

pink cotton, scarce any foliage showing. Both are cliff plants, *S. leucoma* at 16,000–16,500 feet, *S. gossypiphora* fully 1,000 feet higher.

Of Ranunculaceae, several fine species of *Delphinium* are found, one a superb plant of 12 to 18 inches, with numerous large pale blue fragrant flowers. The finest cliff plant of the whole range belongs also to that order, i.e. *Isopyrum grandiflorum* Fisch. It is a real gem, though of extremely slow growth, a cliff alpine, only to be seen in the most inaccessible chimneys and clefts. One plant, photographed with the utmost difficulty, was 18 inches across, and bore over ninety blooms, each 1½ inch in diameter. The colour of the foliage is glaucous-green, the flowers pale purplish-blue, anthers and nectaries bright orange.

The finest Crucifer is also a cliff plant, *Solms-Laubachia pulcherrima* Diels. It is a cluster plant with highly-coloured, glossy, leathery foliage, and large flowers of the clearest turquoise-blue. Unfortunately it also is of slow growth.

Saxifrages are rampant on every cliff, scree, and stony meadow, brightening the dullest spots with their orange and golden blooms. One splendid new species, a cushion plant, named *S. pulchra*, has rose-coloured petals and silvery-grey foliage. Many other new species were found on the range.

Campanulaceae is well represented by several new *Codonopsis* and many new Adenophoras. *Campanula crenulata* Fr., with its deep black-indigo bells, is on every ledge and humus-covered boulder.

Innumerable fine-flowered species of *Pedicularis* colour these alps red and yellow during the summer months, whilst in the autumn blue is dominant in the scheme from the many Gentians and Swertias flowering there.

Of alpine dwarf Rhododendrons there are many: *R. adenogynum*, *R. cephalanthum*, *R. lignosum*, *R. Sargentianum*, *R. cuneatum*, *R. oreotrephes*, *R. intricatum*, *R. prostratum*, *R. rupicolum*, and a large number as yet unnamed. *R. rupicolum* is a new species of the *intricatum* set, having blooms the deepest shade of purple-crimson, the exact colour of plum-juice. *R. prostratum* grows at the greatest altitude of all, fully 16,000 feet. The name indicates its habit; the foliage is small, slightly bullate, glossy and highly coloured; the blooms, produced freely, are relatively large, 1½ inch in diameter, a rich crimson with darker markings.

In such a short account it is impossible to give more than the merest sketch of the finer groups. The country teems with new species, even in the central and southern regions. Much of the province is yet unexplored; in the north and north-west only the veriest fringe has been touched. There a great harvest awaits the first in the field, a harvest of horticultural novelties, which, satiated as we almost are by the many fine things introduced in recent years from Western China, will astonish us.

THE CLEMATIS: ITS DEVELOPMENT AND CULTIVATION.

By A. G. JACKMAN, F.R.H.S.

[Read August 4, 1915; Mr. JOSEPH CHEAL, V.M.H., in the Chair.]

THE Clematis, or Virgin's Bower, belongs to the family Ranunculaceae, and derives its name from the Greek word "klema," a vine branch.

The species are very numerous, the number, according to the "Index Kewensis," being about 250. They are found principally in the temperate zones of both hemispheres, especially in Europe, India, China, Japan, North America, Africa, and New Zealand, and are therefore, with few exceptions, hardy in this country. The only one native in these islands is *Clematis Vitalba*, which is to be seen growing freely in calcareous soils, rambling over hedges, bushes, and hanging cliffs, covered each autumn with profuse tufts of grey, plumose fruit, from which it has gained the name of 'Old Man's Beard.'

The first species introduced into England was *C. Viticella* in the year 1569, and LOUDON observes that the name 'Virgin's Bower' might have been intended as a compliment to Queen Elizabeth, who liked to be called "The Virgin Queen."

This was followed by nine other species during the eighteenth century. Since then the number has gradually increased, and includes *C. patens*, sent over by VON SIEBOLD from Japan about 1836, followed by *C. lanuginosa*, introduced by FORTUNE in 1851, and *C. Fortunei* and *C. Standishii* in 1863, from which most of the magnificent large-flowering varieties have been obtained.

Several species are, however, familiar in our gardens, including *C. montana*, *C. montana rubens*, *C. Flammula*, *C. paniculata*, *C. graveolens*, *C. coccinea*, *C. recta*, *C. integrifolia*, and *C. indivisa*.

There are several other species which, in my opinion, are also worthy of attention, but it would take up too much time to go thoroughly into the list. A few which occur to me more particularly are:—

C. alpina and *C. sibirica*, the blue and white species from the Alps and the mountains of Siberia respectively; *C. campaniflora* and *C. crispa*, with fragrant bell-shaped flowers; the winter-flowering evergreen *C. calycina* and *C. cirrhosa*, with spotted pale creamy-yellow flowers; *C. tangutica*, a rampant sweet-scented yellow species; *C. Armandi*, an evergreen climber from China, which bears a profusion of small white flowers; *C. Buchaniana*, an Indian species, with pale creamy-yellow flowers produced in panicles, well adapted for use in a wild garden; and the two herbaceous species *C. Davidiana*, with hyacinth-

shaped, sky-blue, sweet-scented flowers, and *C. grata* or *C. Jouineana*, a strong-growing, spreading species, with quantities of bluish-white flowers, produced in axillary panicles.

For size and beauty the species are mostly far surpassed by the hybrids, which, for grace, beauty of flower, diversity of colour, and the many different uses to which they can be put, may justly be called the most beautiful climbing plants we have in our gardens.

The first to take up their hybridization systematically was Mr. ANDERSON HENRY, of Edinburgh, who, in 1855, crossed *C. patens* with *C. lanuginosa*, from which he obtained *C.* × *Reginae*, though I believe the honour of raising the first hybrid must be given to Mr. HENDERSON of Pine-apple Nursery, who, sixteen years previously, had raised *C.* × *Hendersoni*, but whether it was an artificially produced or a chance hybrid I am unable to say.

The next to take up hybridizing was my father, who, in 1858, raised the still popular variety *C.* × *Jackmanni*, which he followed up with several others, many of them still in cultivation.

Among them were *C.* × *rubella*, *C.* × *velutina purpurea*, 'The Queen,' 'Fair Rosamond,' 'Mrs. Geo. Jackman,' 'Countess of Lovelace,' 'Sir Garnet Wolseley,' *alba magna*, 'Mrs. Hope,' 'Blue Gem,' 'Princess of Wales,' 'Belle of Woking,' and others.

We are indebted to Mr. T. CRIPPS, of Tunbridge Wells, for 'Lady C. Nevill,' 'Madame van Houtte,' 'Sensation,' 'Star of India,' 'Grand Duchess,' and 'Fairy Queen'; to Mr. C. NOBLE, of Bagshot, for 'Miss Bateman,' 'Lord Londesborough,' 'Lady Londesborough,' 'Mrs. Cholmondeley,' and 'The President'; and to M. V. LEMOINE, of Nancy, for *lanuginosa candida*, 'Otto Froebel,' 'Kermesina,' and 'Lucie Lemoine,' and for several varieties in the herbaceous section.

Varieties of more recent introduction are 'Beauty of Worcester' and 'Snow-white *Jackmanni*' from Messrs. R. SMITH, of Worcester; 'Marcel' and 'Nelly Moser' from Messrs. MOSER, of Versailles; 'Perle d'Azur' and 'Ville de Lyon' from Messrs. F. MOREL, of Lyons; the varieties of the new *Wokingensis* type, viz. :—'Admiration,' 'Countess of Onslow,' 'Duchess of Albany,' 'Duchess of York,' 'Sir Trevor Lawrence,' 'King Edward VII.,' 'Queen Alexandra,' 'Lady Northcliffe,' 'Lady Betty Balfour,' 'Mrs. Spencer Castle,' 'Empress of India,' and *montana superba* from the Woking Nurseries. All of these are marked improvements both in form, size, and colour.

As a decorative plant, the Clematis is almost unequalled; few climbers can surpass it for covering the wall of a house, training over trellis-work, or climbing an arch or pillar. It is also at home in the conservatory or cool greenhouse. Several varieties of the *Jackmanni* and *Viticella* types are also adapted for pegging down in beds, and covering tree-stumps, where, owing to their profusion of bloom, they give a most gorgeous effect.

Some of the smaller-flowered species, such as *C. Flammula*, *C. montana*, *C. Viticella*, *C. graveolens*, *C. Buchaniana*, *C. tangutica*, and

C. Vitalba, are quite in keeping with wild scenery, whilst several of the herbaceous and sub-shrubby species and varieties are worthy of a place in the herbaceous or mixed border, viz.: *C. Davidiana*, *C. recta flore pleno*, *C. recta grandiflora*, *C. integrifolia* hybrids, *C. Pallasi superba*, &c.

With regard to their cultivation, where it can be provided, a rich soil of light loamy texture will be found the best, to which good rotten manure should be added, and if some chalk or slaked lime can also be mixed with it, so much the better. The hole should be dug at least 2 feet square and 2 feet deep, loosening the bottom and sides with a fork. It should then be partly filled with the prepared compost, the plant taken out of the pot and the crocks carefully removed, so as to avoid damaging the roots, and planted in the hole so that when finished off the ball is about 2 inches below the surface of the ground, the soil being trodden firmly round the plant. The depth the plants should be put in I consider of importance, as most of them are propagated by grafting, and when planted so that the union of the scion with the stock is well below the surface of the soil it will be found they quickly form their own roots round it, and young shoots are eventually sent up from the base, the roots of the stock itself becoming inactive.

Being rampant growers, the Clematis prefer a moist soil, though thorough drainage is indispensable to good healthy development, and the vigour of the plants should be maintained by annual manurings with well-rotted horse- or cow-dung.

Clematis also prefer a partly shaded position, so when it is intended to plant them against a wall I would recommend one with an easterly or westerly aspect in preference to full south, as they thus escape the full blaze of the sun and the liability of getting dried up and bark-bound through the inability of the fleshy roots to spread a sufficient distance in search of moisture. A wall with wide overhanging eaves should be avoided.

For growing in a conservatory or cool greenhouse, varieties of the Azurae, Floridae, and Lanuginosae sections will be found the most effective, though there are also a few of the less hardy species, such as *C. indivisa*, *C. indivisa lobata*, and *C. smilacifolia*, which do well under glass.

The plants can be planted out in the conservatory or grown as pot plants. If the latter method is adopted, the young plants should be shifted into larger pots in March, to induce vigorous growth during the summer. This, if properly developed and matured, will produce abundance of lovely flowers the following spring. The young shoots should be trained into position in the early spring, while dormant, so that the young flowering shoots may be naturally distributed over the space required before the blooms expand. The temperature should not exceed 55°, as the Clematis does not respond well to continual forcing, and if it is allowed to be higher the flowers will not be of their true colour.

Proper pruning of the hybrids is of importance, and should take place in the months of February or March. The pruning of the varieties belonging to the Calycinae, Anemoniflorae, Azurae, Floridae, and Lanuginosae types should consist in removing the weak straggling or overcrowded branches. These types flower from the old or ripened wood, so the strong one-year-old wood should be trained in, as far as it has become thoroughly ripened, beyond which it may be cut away, the retained parts being disposed so as to fill up all vacant spaces.

The varieties of the Viticellae and Jackmanni sections, being summer and autumn bloomers, flowering on the young or summer shoots, the pruning should favour the development of vigorous young shoots, and this is done by cutting them back each season to within about a foot of the soil, leaving at least two pairs of axillary buds on each shoot, though I recommend this operation being postponed till they have become thoroughly established.

The varieties of the Viornae, Wokingensis, Aromaticae, Paniculatae, and Erectae sections should have the shoots cut off to where they annually die down.

I will now touch on the sudden "dying off," which has unfortunately affected some of the Clematis.

I have noticed from time to time expressions of opinion in the Press from English and Continental writers, as to the probable cause; amongst them:

1. Frost.
2. Eelworms or fungi.
3. The bursting of the cells through excessive moisture.
4. Too rich food.
5. Grafting.

Dealing with these in their order:—1. There is no doubt that severe late spring frosts do damage the shoots, and cause them to die off, but that is not the case every season. 2. Eelworms have been found to affect the roots, but it is rather the exception than the rule to find them. In these cases the plant would be affected from the root upwards. 3. I have noticed the bursting of the bark of the Clematis due to increased vigour of the shoots after it has ripened and become set, and dying back has sometimes supervened as far as the injury. Excessive moisture and bad drainage are also fatal. This again is not the main reason of their dying, as I notice they mostly go off during the summer months, when the reverse conditions exist, and in situations where the drainage is perfect. 4. An excessive amount of some foods is no doubt harmful, but I do not remember any case of "dying off" coming under my notice where the cause could be brought home to overfeeding. 5. Grafting cannot be the cause, as my experience is that within a few weeks after the plant has been re-potted it commences to form "own roots," as already mentioned, and is then mainly supported by them and not by the roots of the stock. I have also seen seedlings and plants raised from cuttings go

FIG. 78.—PRIMULA PINNATIFIDA, P. PSEUDOSIKKIMENSIS, AND P. SECUNDIFLORA IN THE LICHIANG RANGE, AT 13,000 FT. ALTITUDE.

[To face p. 212.

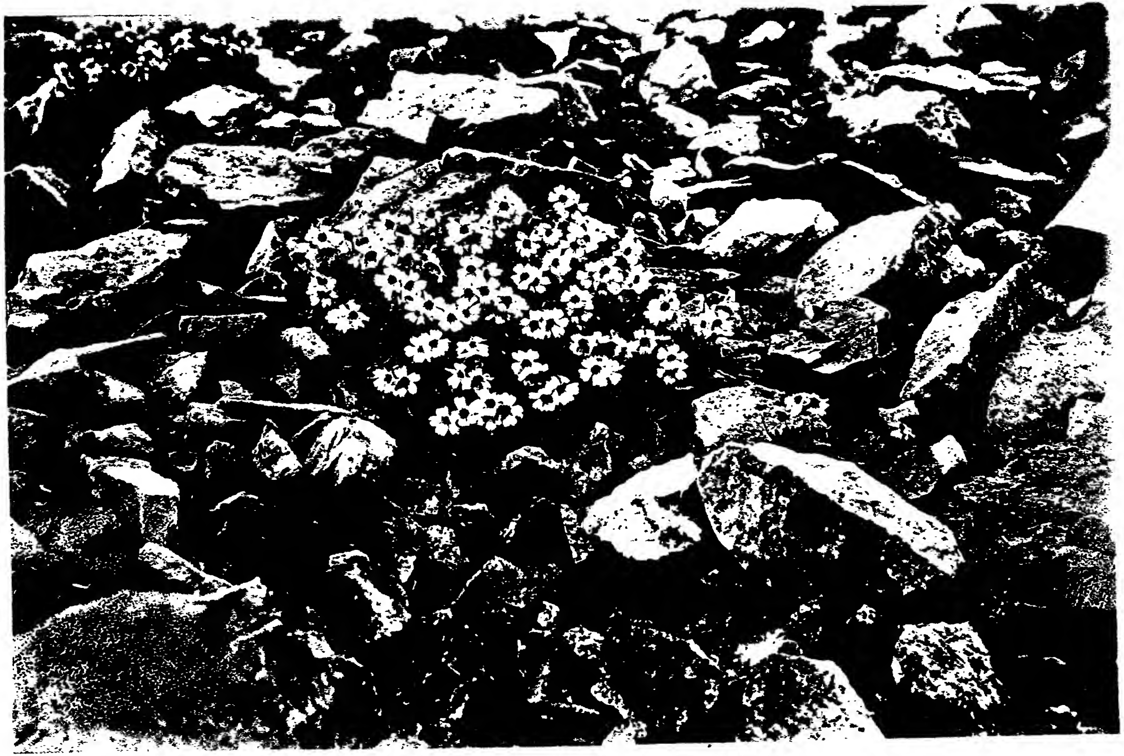

FIG. 79.—A SINGLE PLANT OF PRIMULA DRYADIFOLIA.

off in like manner. Again, the plant would be affected from the base upwards, and not from the top of the shoot downwards.

From these remarks I think you will agree with me that the principal cause of the "dying off" has not yet been discovered, and I will venture to give you what, in my humble opinion, is the cause.

After close investigation and numerous experiments, I have found that, in the majority of cases, the plants have been affected after they have naturally died back (as they all do, more or less, between the end of the growing season and the time for starting into growth the following spring) and these dead parts have been removed. The end of the shoot gradually dies back to the first joint, and in the cases where the young lateral shoots have been afterwards affected I have found that the clogging and decaying of the cells have spread below the axil of the topmost shoot, causing it to succumb, the lower shoots still continuing to grow. This, in my opinion, is caused by bacterial action. If there are no other shoots above ground the plants often throw up fresh ones from the base. This dying back invariably takes place during the summer months, when the plant is in full growth, and requiring the maximum amount of nourishment, which it is unable to obtain. It appears to attack plants of the Lanuginosae and Floridae sections more than the others, which have not so robust a constitution. Fortunately, the small-flowering varieties have proved themselves immune from the complaint, so where the cultivation of the large-flowering varieties is not possible one may, with comparative safety, try these in their place. If less brilliant and striking, they have a dainty and picturesque appearance.

* * * * * *

I have classified the various species and varieties usually met with in gardens under thirteen sections arranged from a horticulturist's point of view, in order to bring together those of similar habit and character, and thereby assist those desirous of making a selection for various seasons and purposes, and likewise as an aid to their cultivation.

1. *Calycinae.*—Climbing evergreen winter bloomers, with medium-sized flowers in aggregated axillary clusters on the old or ripened wood.

2. *Anemoniflorae.*—Climbing spring bloomers with medium-sized flowers in aggregated axillary clusters on the old or ripened wood.

3. *Atragenae.*—Slender climbing early spring bloomers, with medium-sized flowers on the old or ripened wood.

4. *Azurae.*—Climbing, large-flowered spring bloomers, flowering from the old or ripened wood.

5. *Floridae.*—Climbing, large double-flowered summer bloomers, flowering from the old or ripened wood.

6. *Lanuginosae.*—Climbing, large-flowered summer and autumn bloomers, flowering successionally on short lateral summer shoots, the flowers dispersed.

7. *Jackmanni.*—Climbing, large-flowered summer and autumn

bloomers, flowering successionally in profuse continuous masses on the young or summer shoots.

8. *Viticellae.* — Climbing, large-flowered summer and autumn bloomers flowering successionally in profuse masses on the young or summer shoots.

9. *Paniculatae.*—Climbing, small-flowered summer and autumn bloomers, flowering profusely, from axillary growths of the young or summer shoots.

10. *Wokingensis.*—Climbing, sub-shrubby, medium-sized, campanulate summer and autumn bloomers, flowering successionally in profuse masses on summer shoots.

11. *Viornae.* — Climbing, sub-shrubby, small-flowered, pitcher-shaped, summer and autumn bloomers, flowering successionally on summer shoots.

12. *Aromaticae.*—Non-climbing, sub-shrubby, summer and autumn bloomers, flowering successionally on summer shoots.

13. *Erectae.*—Non-climbing, herbaceous, profuse, summer and autumn bloomers.

Selections for Various Purposes.

For growing in the Conservatory or Greenhouse.

Armandi.
Beauty of Worcester.
Belle Nantaise.
Belle of Woking.
Blue Gem.
calycina.
cirrhosa.
Duchess of Edinburgh.
Fair Rosamond.
Fairy Queen.
Gloire de St. Julien.
Henryi.
indivisa.
indivisa lobata.
Lady C. Nevill.
Lady Londesborough.
Lady Northcliffe.
lanuginosa.
Lasurstern.
Lord Nevill.
Marie Boisselot.
Miss Bateman.
Mrs. Geo. Jackson.
Mrs. Hope.
Nelly Moser.
Otto Froebel.
Princess of Wales.
Sensation.
Sir Garnet Wolseley.
Snow-white *Jackmanni.*
Stella.
The Queen.
Wm. Kennett.

For planting against Walls.

Armandi.
ascotiensis.
Beauty of Worcester.
Belle Nantaise.
Belle of Woking.
Blue Gem.
calycina.
cirrhosa.
Comtesse de Bouchaud.
Countess of Lovelace.
Fair Rosamond.
Fairy Queen.
Gipsy Queen.
Gloire de St. Julien.
Henryi.
Jackmanni.
Jackmanni alba.
Jackmanni rubra.
Jackmanni superba.
Lady Betty Balfour.
Lady C. Nevill.
Lady Northcliffe.
lanuginosa.
Lasurstern.

Lord Nevill.
Madame Edouard André.
Madame Grange.
magnifica.
Marie Boisselot.
Miss Bateman.
montana superba
Mrs. Cholmondeley.
Mrs. Geo. Jackman.
Mrs. Spencer Castle.
Nelly Moser.
Otto Froebel.
Princess of Wales.
Robert Hanbury.
rubella.
Sensation.
Sir Garnet Wolseley.
Star of India.
Stella.
The President.
The Queen.
velutina purpurea.
Ville de Lyon.
Viticella alba.
Wm. Kennett.

For growing on Arches, Pergolas, or Pillars.

Admiration.
ascotiensis.
Beauty of Worcester.
Belle of Woking.
Blue Gem.
Buchaniana.
campaniflora.
coccinea.
Comtesse de Bouchaud.
Countess of Lovelace.
Countess of Onslow.
crispa.
Duchess of Albany.
Duchess of York.
Fair Rosamond.
Fairy Queen.
Gipsy Queen.
Gloire de St. Julien.
graveolens.
Henryi.
Jackmanni.
Jackmanni alba.
Jackmanni rubra.
Jackmanni superba.
Kermesina
Lady Betty Balfour.
Lady C. Nevill.
Lady Londesborough.
Lady Northcliffe.
Lasurstern.
Lord Nevill.
Madame Edouard André.
Madame Grange.
magnifica.
Marie Boisselot.
Miss Bateman.
Mrs. Cholmondeley.
Mrs. Geo. Jackman.
Mrs. Hope.
Mrs. Spencer Castle.
montana rubens.
montana superba.
Nelly Moser.
Princess of Wales.
purpurea elegans.
Robert Hanbury.
rubella.
Sensation.
Sir Garnet Wolseley.
Star of India.
Stella.
tangutica.
The President.
The Queen.
velutina purpurea.
Ville de Lyon.
Viticella alba.

For Herbaceous and Mixed Borders.

coerulea odorata.
Davidiana.
integrifolia.
integrifolia Durandi.
integrifolia hybrids.
lathyrifolia.
Pallasi superba.
paniculata.
recta fl. pl.
recta grandiflora.
tubulosa.

For growing in Rock Gardens.

alpina.
austriaca.
grata.
sibirica.
Wilfordi.

For Wild Gardening.

Buchaniana.
campaniflora.
coerulea odorata.
Flammula.
Flammula rosea purpurea.
grata.
graveolens.
montana.
orientalis.
paniculata.
tangutica.
Vitalba.
Viticella.
Wilfordi.

For Permanent Bedding out, or Growing over Roots or Tree Stumps.

ascotiensis.
Comtesse de Bouchaud.
Gipsy Queen.
Jackmanni.
Jackmanni alba.
Jackmanni rubra.
Jackmanni superba.
Kermesina.
Lady Northcliffe.
Madame Edouard André.
Madame Grange.
magnifica.
Mrs. Cholmondeley.
rubella.
Star of India.
The President.
velutina purpurea.
Ville de Lyon.
Viticella alba.

THE RESPECTIVE VALUES OF ORGANIC AND INORGANIC MANURES.

By H. E. P. Hodsoll, F.C.S., M.S.E.A.C.

[Read August 31, 1915; Dr. F. Keeble, F.R.S., in the Chair.]

One of the results of the great increase in the use of artificial manures in recent years is that their variety has grown with the demand, and the question of their comparative values and peculiar properties has become one of some complexity and at the same time of great importance to all interested in horticulture.

With the increase of motor traffic and mechanical transport the horse is fast disappearing from our streets. While this is a fact on which the general public may undoubtedly congratulate itself, bringing as it does quicker and more efficient transport and cleaner and healthier streets, yet to one class of the community—the market grower—the change is a serious matter. This is particularly so in the districts round London and the big towns where for generations stable manure—with perhaps, latterly, a little nitrate of soda—has been almost the only fertilizer used; consequently its increasing scarcity is producing something akin to dismay in the mind of the grower, who is faced with the necessity of finding some other means of enriching his soil in order that he may maintain the standard of his production.

I want to show that the pith of the matter is the vexed question of the respective values of these two classes of manures, and that if we understood their action in the soil and on the plant it would greatly assist us in deciding what artificial to use for the purpose we had in view.

Unfortunately, although this question has long been the subject of controversy among scientists, it has received little practical attention at the hands of scientific investigators or the authorities in charge of our Experimental Stations and any evidence that we can obtain from the latter is therefore necessarily indirect and circumstantial.

First let us see what is meant by organic and inorganic manures. The former are those having an organic or living origin: that is, they are obtained from some living thing either animal or vegetable. Under this heading, therefore, we have farmyard manure and such artificials as crushed hoof, meat meals, bone stuffs, shoddy, feathers, &c., from an animal source, and rape meal, castor meal, and green manures from the vegetable kingdom.

Inorganic manures are those having an inanimate or mineral

origin, such as the mineral phosphates of various kinds, superphosphate, basic slag, nitrate of soda, sulphate of ammonia, and the mineral potash salts.

I want to discuss the relative merits of these two classes of manures and account for the superiority of the one over the other for certain definite purposes, in order that the user may judge for himself as to which will give him the result at which he is aiming.

The first thing that strikes one in considering this question is the very much higher price, especially in ammoniacal manures, that the user will pay—and has paid for years—for organic manures. For instance, in normal times the unit price of ammonia in crushed hoof or dried blood has stood at about 16*s*. or 17*s*., whereas the unit of ammonia in nitrate of soda or sulphate of ammonia has cost only 12*s*. to 13*s*. Why this preference? Most chemists, and until quite recently the Board of Agriculture, have said that the value of these manurial units is the same whatever their source, the sole determining factor being their solubility. But organic manures are less soluble than inorganic, and should, according to this argument, be cheaper instead of dearer.

It is obvious, therefore, that there is more in the respective merits of these two classes of manures than the holders of the mineral theory, as it is called, would have us believe. As A. D. Hall, one of the greatest of our present-day authorities on the subject of manuring, says, "The farmer has a strong preference, to which credit must be given as founded upon experience, for the organic sources of nitrogen."

Before going further into our argument it will perhaps be interesting to look at the results of a few of the Rothamsted experiments that bear somewhat on the point.

Table I. shows an experiment carried out over a number of years with a view to ascertaining the comparative values of rape cake (organic), sulphate of ammonia, and nitrate of soda (inorganic) as nitrogenous manures for mangolds. The complete minerals (superphosphate and sulphate of potash) were the same in each case. It will be seen that 4C, the rape cake plot, shows a far higher average crop than either of the mineral plots, and further that the number of plants on this plot—a significant fact to which I shall refer later—is far in excess of those on either of the other two plots.

TABLE I.—EFFECT OF MANURES ON MANGOLDS.
(Rothamsted, 1876–1902.)

Plot.	Manures.	Average crop per acre.	Average No. of roots per acre.
		Tons.	Number.
4C	Complete minerals with rape cake	21·3	17,474
4A	Complete minerals with ammonium salts	14·9	14,802
4N	Complete minerals with nitrate of soda	18·0	14,130

Table II. shows the same experiment with farmyard manure added. Rape cake, it will be seen, is not only far superior to the inorganic ammonias, but gives a better result than farmyard manure in spite of the fact that the amount of nitrogen applied in the latter case is more than double that contained in the rape cake dressing. The moral of this is, I think, the value of the soluble form of organic over the insoluble, the ammonia in the rape cake being more available for the plant than that in the dung.

TABLE II.—MANGOLDS, DIFFERENT MANURES, ROTHAMSTED.

Plots.	Manure.	Containing N per acre.	Average produce per acre.
4N	Nitrate of soda	86	17·95
4A	Ammonium salts	86	15·12
4C	Rape cake	98	20·95
1°	Farmyard manure	200	17·44

Table III. shows the effect of the same three sources of nitrogen with different combinations of other manures. It will be noticed that the nitrate of soda plot beats that receiving rape cake when no potash is added; that is owing to the fact that, as is well known, soda liberates potash in the soil, and potash is very necessary for mangolds. The beneficial effect of soda in this respect, and its consequent superiority over sulphate of ammonia, are noticeable also in Tables I. and II., and to a slight extent in the last two columns of this table; it is interesting, but has no direct bearing on the subject under discussion.

TABLE III.—AVERAGE YIELD OF MANGOLDS.
(Rothamsted, 32 years, 1876–1907.)

	Superphosphate.		Dung.	
	No potash.	Potash, &c.	Alone.	With phosphate and potash.
Rape cake = 98 lb. N . .	11·1	22·0	24·5	25·7
Nitrate of soda = 86 lb. N .	15·3	18·0	25·9	26·4
Ammonium salts = 86 lb. N .	7·5	15·2	22·5	24·0

When potash is added together with the superphosphate the rape cake again shows its superiority. The most interesting fact about this experiment, however, is that when dung is added the rape cake plot shows no marked increase, proving that the amount of organic matter present in the rape cake is almost sufficient for the crop, or in other words the humus required by the crop can be supplied by artificials alone, and that the addition of dung is not, as so many think, absolutely essential. This fact should reassure those who regard the increasing scarcity of dung with so much misgiving.

On the other hand, it will be seen that the nitrate of soda and sulphate of ammonia plots benefit greatly by the addition of dung, as it supplies the important ingredient, humus, that was otherwise lacking.

Table IV. shows the relative yield of various crops from the use of superphosphate, basic slag, and bone meal as sources of phosphate. It will be seen that the longer the crop is on the land the better is the yield from bone meal, as in the case of wheat and swedes, whereas with the shorter crops, barley and mangolds, it is not as good as that obtained from the mineral phosphates. This is due to the slower solubility of bone meal, and had a more soluble form of organic phosphate been used the superiority would undoubtedly have been more marked.

TABLE IV.—RELATIVE YIELD FROM VARIOUS PHOSPHATES.
(Rothamsted) Unmanured = 100.

Crop.	Superphosphate.	Basic slag.	Bone meal.
Swedes . .	120	116	126
Barley . .	119	121	110
Mangolds . .	114	105	111
Wheat . .	106	108	117
Swedes . .	132	109	131
Means . .	118	112	119

The experiments of the Highland Society have also shown bone flour to be more successful than any other phosphatic manure for turnips.

It will therefore be seen from these experiments that organics fully hold their own against the corresponding mineral unit. Further, they are not all exhausted in one year, but leave behind valuable residues for following years. This has been clearly proved at Rothamsted, where the effect of dung has actually been detected forty years after its application. This is not so with mineral ammoniacal manures, which both the Rothamsted and Woburn experiments show are practically exhausted in one year.

It is clear, therefore, that we cannot dismiss the question on solubility only, for, as we have seen, organic manures even supplied in the raw state not only give better results but leave the soil richer instead of poorer, and had the soluble organic manures that are now obtainable been used in the experiments doubtless their superiority would have been even more marked.

This conclusion, of course, will not surprise practical men. We all know the value of dung, crushed hoof, meat and bone stuffs, &c., and that we cannot get good crops by the use of minerals alone, or put heart into a poor soil by the application of superphosphate and nitrate. The point is, why cannot we? Wherein lies the undoubted superiority of the organic manures for these purposes?

I think we can best answer these questions by considering the

action in the soil of the two classes of manures from three points of view, viz. the mechanical, chemical, and biological.

1. *Mechanical.*—Let us first examine their effect on the mechanical or physical condition of the soil. Now all organic substances contain humus: that is, they leave behind, after they have decayed in the soil, that valuable residue that we have learnt to associate with the use of farmyard manure or leaf-mould &c.; and this humus, which more than any other ingredient is always tending to oxidize and diminish in the soil, has a very marked effect on its working.

Humus opens a clay soil by loosely binding together the finer particles to which its plastic nature is due. These particles are so fine as to assume when extracted from the soil an almost gelatinous nature, and when they are spread out, or "deflocculated" throughout the soil they make the whole into a sticky unworkable mass, giving the clay what is known as its colloid property. It is this property that enables the potter so to work his clay that he can mould it at will, and upon which the brick-maker relies when he puddles his brick-earth before moulding his bricks.

All practical men are painfully aware of this characteristic of a heavy soil when they try to work it after rain before it is sufficiently dry, and their aim in cultivation is to counteract it as far as possible and so to manage their heavy soils that they may crumble down into a fine and workable condition.

Humus greatly assists in this endeavour by collecting together or "flocculating" these fine particles; perhaps the simplest instance of this action of humus is that afforded when a piece of old grass land naturally rich in humus is ploughed up, especially if the soil be heavy. After the winter it will crumble readily, so as to harrow down to a mellow seed-bed while on a neighbouring piece of the same soil that has been arable for some time a number of large unyielding clods will probably be noticed.

Again, on a light soil, humus, by acting in a contrary direction, has an equally beneficial effect; in this case it loosely binds together the coarser particles, imparting to the soil more of a spongy or retentive nature.

This mechanical effect of humus leads to the following advantages in soils well supplied with this important ingredient:—

The land retains much heat otherwise lost, and, being warmer, the crops consequently ripen earlier.

The land dries more quickly, yet retains its moisture better in drought.

The superfluous moisture from storms and heavy showers is held as by a sponge and passes downwards gradually, thus all wash is avoided; the water-retaining power of a soil well supplied with humus is 20 per cent. greater than that possessed by a mineralized soil.

In dry weather the land cools sooner and more dew is precipitated. The air passing over humus-fed soil is cooler and moister

than the air passing over a mineralized soil; the rainfall will therefore be greater. If the soil all over the country were richer in humus the rainfall would be more uniform, as in countries covered with forests.

The soil, being more open, is better aerated, and consequently more plant food is set free.

Much manurial matter that would otherwise leach away is retained.

The plants are healthier; a soil deficient in humus is always more likely to support disease: clover sickness and finger-and-toe are never so prevalent on soils showing a high humic content.

Of this fact the Indian coffee planters are well aware; as long as their soils were well stored with the vegetable matter of the primeval forests which previously occupied the site of their plantations, there was very little disease among the plants; as soon as the humus became exhausted diseases increased, but have again been reduced by adding the top soil from the neighbouring forest lands.

The importance of a good tilth and a good seed-bed cannot be over-estimated; in fact, if the weather conditions are adverse to the start of a crop, the eventual yield will often depend more on the physical condition of the seed-bed than upon any other factor. No better proof of this fact could be given than that afforded by Table I. from the Rothamsted experiments given above. As has been previously pointed out, there are always more roots on the rape cake plot than on the others, showing that the conditions are far better for the young plants; in fact, the physical condition of the soil where only minerals are used has become so bad that only in favourable seasons is a good plant obtained and on three occasions the sowings have completely failed, whereas the rape cake plot always starts regularly.

Against these many advantages of the humus-containing organic manures we have to place the distinctly bad effect that most mineral manures are known to have on the physical condition of the soil.

Probably nitrate of soda is the worst, owing to the fact that the residue it leaves behind in the soil—caustic soda—deflocculates the clay, which consequently becomes puddled.

Sulphate of ammonia and superphosphate leave an acid residue which is harmful to plant life, and still more so to bacterial activity.

It is true that those minerals which leave lime as a residue in the soil, such as basic slag and nitrolim, are not subject in the same way to this objection, but it is undoubtedly true to say that one of the great advantages of organics over inorganics is that the former materially improve the texture of the soil by increasing the supply of humus, and thus enable a good seed-bed to be obtained and a good tilth maintained, whereas the latter, generally speaking, have an opposite effect.

2. *Chemical.*—Under this heading I want to consider the chemical form in which the food materials exist in the two classes of manures,

and to show how this affects the feeding and consequent growth of the plant.

The outstanding feature of organics from a chemical point of view is that the food materials they contain are not all present in one form, but exist in a large number of different and complicated chemical compounds; and it follows that these compounds, being differently constituted, vary greatly in their availability as plant food, and therefore come into use (chiefly by the aid of bacteria, as we shall see later) gradually and continuously.

On the other hand, the minerals are mostly definite chemical salts of known and comparatively simple composition; it follows, therefore, that the conditions—of temperature, moisture, &c.—that render one of their food units available for the plant will have the same effect on the rest, so that the whole becomes available for the plant at the same time. This not only means that while this process is taking place the plant has too much food, but, being unable to take it all, the remainder is washed out of the soil and lost, and is not there when the plant is ready to take in further supplies. This objection, of course, particularly applies to the highly soluble nitrogenous manures, nitrate of soda, and sulphate of ammonia.

It has been abundantly proved that, for good quality in the product, manures that come steadily into use throughout the season are required, rather than the very active ones that induce a sudden rush of growth.

Further, the gradual availability of organics builds up a reserve of food materials in the soil, so that eventually the land becomes stored with manurial residues.

It must be remembered that the soil is more rapidly exhausted of ammonia than of phosphate or potash, so it is particularly necessary that ammonia should be obtained from an organic source. That this fact is realized by horticulturists is proved by the demand for organic ammoniacal manures, the higher price paid for these per unit over the minerals being greater in proportion than that paid for the organic as against the inorganic units of phosphate.

HALL states in one of his well-known works: "The hop-grower, for instance, won't get the quality he wants by substituting a mixture of super and sulphate for the guanos or organic manures he has been accustomed to use"; and again:

"It is only a lasting manure which accumulates in the soil to build up 'high condition,' the state of affairs which prevails when reserves of manure in the soil are steadily and continuously passing into the available condition in sufficient amount for the need of the crop, a state of affairs which results in healthy growth of good quality."

It is evident, therefore, that the slow and gradual solubility and lasting nature of organics is of the utmost importance, and is another reason for their superiority over the minerals, which, as I have shown, do not possess these valuable qualities.

3. *Biological.*—Lastly, let us consider the effect of these two classes of manures on the bacterial life of the soil. This is, perhaps, the most important aspect of all. For some time it had been difficult fully to explain the effect of organic manures on the growth of the crop, and to account for the fact that plants so fed seemed to have more " life " in them. One could only say that decayed animal and vegetable matter was the natural plant food, and that there was probably some affinity in the life of the organic materials —as evinced by the growth of fungi &c. that they support (by some erroneously considered a disadvantage)—and the life of the plant; though, needless to say, this was scoffed at by the holders of the mineral theory.

Recent work on bacteriology undertaken and ably carried out, among others, by RUSSELL and HUTCHINSON of Rothamsted, has thrown much light on the subject. They have shown that bacteria are absolutely dependent upon humus in the soil, that they feed on it, use it as their fuel, and get their energy and power from its combustion, and it is thus absolutely essential for their life.

We now know that the soil is not an inert mass acting merely as a medium to hold plant foods, and an anchorage for their roots, but that it is indeed alive, that it is in fact a huge factory peopled by millions of minute organisms that are there to prepare the food already in the soil and supplied as manure for the delicate root-hairs of the plant.

It has been shown that these workers are wonderfully organized, that there is a perfect division of labour among them, each group having its appointed task; when each particular group has done its part, it, so to speak, hands it on to another for the next operation, and so on until the insoluble material on which they are working has been completely broken down into a form readily assimilable by the plant.

When we realize that such substances as farmyard manure would not only be useless, but actually harmful to the plant, were it not for the action of these beneficial bacteria, we begin to see the importance of the part they play in plant nutrition and in the great scheme of life.

It is impossible in the short time we have at our disposal to go into this fascinating study, but as an instance of how these minute organisms work it is interesting to note that every organic manure that is applied to the soil has to be attacked by at least three separate groups of bacteria before the plant can get at the ammonia it contains, the nitrogen being first turned to ammonia, then to nitrite, and lastly to nitrate, which is soluble and can be taken up by the plant.

Another bacterium has the power of fixing the free nitrogen of the air and bringing it into use for the plants.

Bacteria also play an important part in bringing phosphates

and potash into solution. It has been proved that mineral phosphates only work well on a soil containing plenty of organic matter; this is because the carbonic acid gas generated by the bacteria enters into the water and dissolves the phosphates, otherwise they are very ineffective.

It is clear, therefore, that we are absolutely dependent on the bacteria in the soil, and especially is this the case with the intensive cultivator who uses the soil as a manufacturing medium to convert the fertilizers he applies into crops.

As I have said, bacteria feed on humus and must have it, and we therefore see how necessary it is to use organic manures that supply this all-important ingredient.

On the other hand, the mineral manures, as we have seen, not only contain no humus, but by the acid residues they leave in the soil (especially superphosphate and sulphate of ammonia), and by the bad effect they have on its physical condition, they are actually harmful to bacterial life.

So that from this aspect also we see that the organic manures are far preferable to those obtained from mineral sources.

In spite of these great advantages, however, I do not deny that the minerals have their uses. For rapid results, in cases where we want to stimulate the plant into very quick growth, we must use the mineral forms of nitrogen—such as nitrate of soda, nitrate of lime, sulphate of ammonia, &c.—because they require to undergo practically no change before being taken up by the plant. They produce an unnaturally quick, soft, and sappy growth, just the thing we want to avoid in permanent crops like fruit, but, on the other hand, just the thing we require in green crops like cabbage, lettuce, &c., because besides giving us earliness they also produce a tender leaf, though, if this is overdone, the produce is apt to be unwholesome as food.

There is probably also another reason why minerals are of considerable value, and this is the subject of very interesting investigation by the American agricultural chemists.

It is now generally admitted that all plants, as a result of their growth, give rise to a certain toxin or poison in the soil, the toxin being peculiar to the particular crop, and, as a rule, a poison only to that crop. In some kinds of plants this is much more noticeable than in others; probably two good instances are strawberries and clover, which, as we know, are difficult to grow continuously on the same site. At the other extremity we have wheat and mangolds, which Rothamsted shows us can be grown for many years in succession on the same soil.

These toxins have probably a great deal to do with the advantages of rotation, as this system gives the soil time to rid itself of these substances, which we must remember are poisonous to the one crop only.

Intimately connected with this matter is the recent work of

RUSSELL and HUTCHINSON on soil sterilization. They found that after the soil had been sterilized plants grew very vigorously in it. The reason for this vigorous growth is probably that owing to intensive cultivation the bacterial flora had got out of balance, and that a certain comparatively big amœba that feeds on the beneficial bacteria had got the upper hand.

Owing to its larger size, this amœba is more vulnerable, and suffers more than the beneficial bacteria from the sterilization; consequently, after that operation, the latter, being relieved to a large extent of the preying of the amœba, are able again to flourish, with the result that they carry on their work more vigorously than ever, and large quantities of dormant food material are again prepared for the plant.

The reason why I have mentioned this is that the work of the Americans goes to show that the mineral manures act on the soil as a partial sterilization: that is, to bring about to a slight extent the state of things to which I have just referred; and for this reason they are beginning to regard them as useful, mainly for combating the soil toxins.

This is a most interesting theory, and if correct—as there seems every reason to believe—provides a further instance of the use of minerals.

The practical conclusion of the matter is therefore probably this:—

Use organic manures as a base to supply humus, and thus improve the texture of your soil and enable you to get a good tilth and a good seed-bed, to give you gradual feeding of the crop, which promotes healthy growth and good quality, and to provide humus to feed bacteria.

Use mineral manures as a top dressing for rapid growth, and to act as a sterilizer to keep the bacterial flora in balance.

AN OIDIUM MILDEW ON CARNATIONS.

By W. B. MERCER, B.Sc., Adviser in Agricultural Botany, Armstrong College.

IN the early summer of 1914 specimens of mildewed carnations were sent in to Armstrong College from the greenhouses of a garden in the Tyne Valley. The fungus proved on examination to be a member of the Erysiphaceae.

The outbreak at first threatened to be a serious matter, as it quickly spread to all the houses in the garden, and a number of plants became so infested with the fungus that they had to be burned. It was soon found, however, that the disease could be held in check by means of repeated sprayings. Though it has not yet been stamped out entirely, it has been reduced, by these means, to insignificant proportions. The writer, indeed, has recently been able to obtain specimens for microscopical examination only after careful and prolonged search.

The object of this note is to draw attention to the existence of the disease—of which there do not appear to be previous records—and to indicate the means by which it has been controlled in the case under discussion.

The disease is characterized by the appearance on the leaves and calyx of the plant of patches of white mould, which gradually spread and eventually assume a yellowish hue. Occasionally the mildew appears upon the petals, but this is rare. It has been observed in greater or less degree upon a number of varieties, but 'Lady Alington,' 'Bridesmaid,' and 'British Triumph' have on the whole suffered the worst. It has been especially noticeable upon young flower-buds of the last-named variety.

The fungus, like other members of the family, is confined to the outside of the host plant. Its mycelium forms a weft of threads over the surface of the leaf or sepal, and here and there produces a short branch or appressorium, which applies itself closely to the epidermal wall. From the appressorium a fine threadlike branch, known as a haustorium, bores its way through the thick cuticle with which the outer wall of the epidermis is provided and penetrates into an epidermal cell beneath.

Inside the epidermal cell it becomes greatly distended, presumably for the sake of increasing the feeding surface. A single epidermal cell frequently contains two or three of these sacculate endings to haustoria, the cell cavity in some cases being thereby almost filled.

The fungus produces chains of elongated colourless conidia, on simple upright branches, springing from the superficial mycelium, (fig. 80, A). The conidia become detached from one another very easily.

The spores are fairly uniform in size, averaging 55–60 μ long and 15–17 μ wide.* Spores up to 65 μ and down to 45 μ long have been observed, the width ranging from 13 μ to 18 μ. The longer spores are not proportionately thick. The conidia germinate readily in

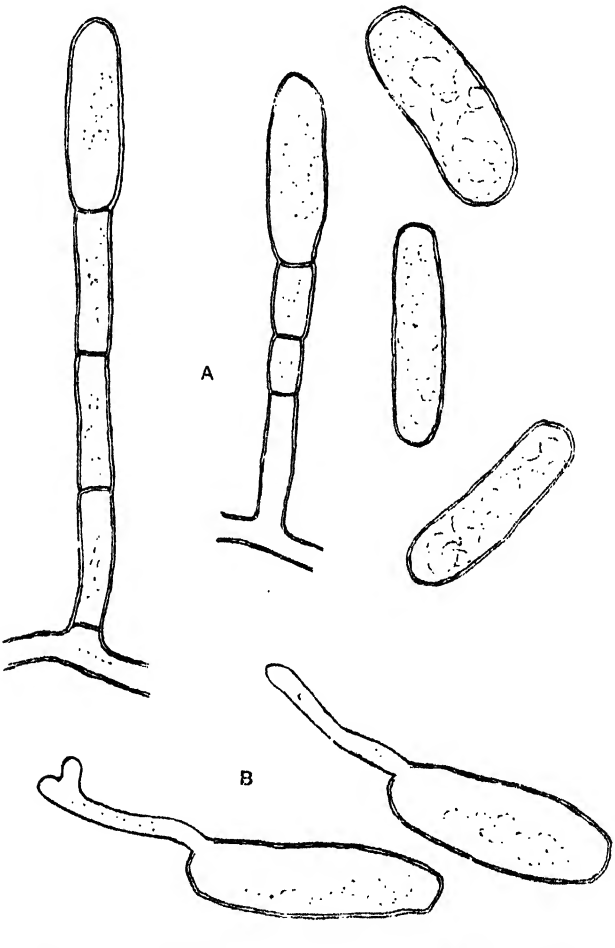

FIG. 80.—A. CONIDIA; B, CONIDIA GERMINATING (×550).

moist air by the production of a germ tube from a point near one pole (fig. 80, B).

All the members of this group of fungi produce a second, more complex fructification in the shape of asci, in a perithecium. The perithecium belonging to this fungus has not yet been observed, and as the various genera are identified by means of the perithecium,

* $\mu = \frac{1}{1000}$ mm.

it is not yet possible to refer the carnation fungus to its proper species. The probabilities are that it represents a species which normally occurs on other plants, but which is in process of extending its range of hosts.

Treatment.—As soon as the nature of the disease was determined, steps were taken to combat it. All the plants were at once sprayed with a copper-ammonia mixture,* and at the same time the pots and stands were as far as possible similarly disinfected. Thereafter, for the remainder of the summer, the plants were sprayed regularly every week or ten days.

It was at first intended to try a number of different sprays, but the effects of the first two or three dressings with copper-ammonia mixture were good enough to justify the continued use of this particular spray, and, as there were no means of isolating infected plants, considerable risk would have attended a trial with other sprays.

Two per cent. lime-sulphur mixture was, however, tried on a few plants. It was thoroughly effective as regards checking the fungus, but the plants were so disfigured by the tenacious white deposit that the dressing was not repeated.

An occasional spraying during the early autumn sufficed to keep the plants clean, and during the winter and the present season it has only been necessary to pick off the few mildewed flower-buds which have appeared and to paint over with copper-ammonia mixture such spots on the leaves as could from time to time be discovered.

So far as it is possible to see, therefore, the disease has been effectively controlled by repeated sprayings, and this course of treatment can be recommended in the case of similar outbreaks, with considerable confidence. The superficial habit of the mycelium makes it an easier subject to deal with than is the case with deep-seated parasites. It is probable, too, that the fungus has not yet become thoroughly confirmed in its parasitic habit on this particular host plant. Indeed, it is difficult to account on any other grounds for the comparative ease with which it has been subdued.

* Stock mixture made up as follows:—1¾ lb. crystallized copper sulphate, 1 quart strong ammonia, 2½ gallons water. Half a pint of this mixture diluted to 4 gallons with water before use.

WINTER WASHES TRIED AT WISLEY, 1914–15.

By Professor H. M. Lefroy, M.A., Entomologist.

The points tested in this trial of winter washes for fruit trees were :—

1. Solubility in, or miscibility with water.
2. Corrosiveness (ease of spraying).
3. Effect on workers or their clothes.
4. Wetting power.
5. Cost.
6. Effectiveness.

The conditions under which the washes were tried are set forth below.

The following notes will make clear the meaning of the six points referred to.

1. The washes were made up with cold water in the manner recommended by the makers. As all mixed freely this point is not further considered, but it was noted that some required more preparation than the simple mixing of a wash with water ; this is regarded as a disadvantage, as more skill and care are required to make and mix two solutions than to make one, and there is greater risk of a mistake being made.

2. Corrosiveness refers particularly to risk of injury to machines rubber tubing. Some sulphur compounds attack copper or brass ; some caustic solutions loosen rubber tube connexions ; some paraffin washes attack rubber. It is an advantage if the wash has none of these characteristics.

3. Some winter washes are so caustic that the workers must wear goggles, rubber gloves, and waterproof overalls ; this is a disadvantage. So too is a wash that is markedly poisonous, though this is an unusual feature.

4. Wetting power. No wash with very deficient wetting power would be likely to succeed ; the point was noted by eye only, and not much importance is attached to it. Good wetting power means economy, less wash being used.

5. Cost. It is possible to get absolutely effective washes easily if the consideration of cost is eliminated. One of the most effective that happens to have been used (not in the trial, but experimentally) costs £75 for 100 gallons. This is, of course, ridiculous, but it shows that the cost must be kept in view. In estimating cost there is this point : a wash selling at a certain price for a single gallon tin through a

retailer might sell at half that price in 40-gallon barrels direct from the maker. It is not fair to compare the two. We have tried to get a fair basis of comparison on the figures supplied, taking the retail price of a gallon ; but not too much stress has been laid on this point, as all the data were not available.

6. Effectiveness. This is the real consideration, and no wash has been considered as effective unless it complied with the very simple requirements of the tests: namely, to clean off moss, lichen, algæ, or other superficial growths from the trunks of the trees to which the washes were applied. No wash was considered at all unless it quite clearly and definitely cleaned lightly "mossy" trees.

In this connexion it is to be noticed that a winter wash may be too drastic, its repeated application being likely to injure the bark ; only two washes exhibit this characteristic, but it is important, and the best washes should clean the trees without removing an undue amount of bark or injuring the bark below.

Application.—Nineteen washes in all were tried, under, as far as possible, similar conditions. They were made up fresh on the day they were applied, sprayed in turn from the same machine with a pressure of 40 lb. to the square inch, and applied on the same day to trees selected as being as nearly as possible equally mossy. The trees were :—(1) Young bush apples, of which the trunks were sprayed. (2) Old Apple trees, of which the trunks were sprayed to 6 feet from the ground. (3) Young Plum trees of which the trunks were sprayed.

The first spraying was on January 20 ; after ten washes had been applied light rain stopped the work. Ten days later these were examined, and it was evident that the trees could be definitely classed according to the effect.

On February 5 the whole twenty washes were applied to one young Apple, two young Plums, and one old Apple each, the whole being done in one day. The day was fine and cold ; light rain fell next day. The washes were numbered, and no further information was then available as to names, composition, or prices. As each was applied, it was noted if the wash "wetted" well, its appearance or smell, whether it had mixed in cold water, and whether, in application, the operator was inconvenienced by its being caustic. The trees were scrutinized on February 23 and at later dates. Their appearance was noted in each case in comparison with the control tree next. As the effects produced do not appear equally rapidly in all, the first definite marking was not done till March 23, and this has been checked since. Four independent observers noted separately. Two washes of known composition were used as controls. One was a very common wash, the other an entirely new substance under test as an insecticide. The first table on the following page is a marking produced as an example of the manner in which the judging was done.

As some of the washes did not definitely fall into any class, they were repeated on the same trees, this constituting a repeated application such as is sometimes recommended. In all, fourteen markings

were made between four different observers. In most cases there were the above three classes:—"clean" being first, "better" being

No.	Young Apple.	Old Apple.	Plum.
1	Clean	Clean	Clean
2	Clean	Clean	Clean
3	Better	Better	Better
4	Clean	Clean	Clean
5	Fails	Fails	Fails
6	Fails	Fails	Fails
7	Clean	Clean	Clean
8	Clean	Clean	Better
9	Clean	Clean	Clean
10	Better	Better	Fails
11	Clean	Clean	Clean
12	Fails	Fails	Fails
13	Clean	Better	Fails
14	Clean	Clean	Clean
15	Fails	Fails	Fails
16	Fails	Fails	Fails
17	Better	Better	Clean
18	No entry	—	—
19	Fails	Fails	Fails
20	Clean	Clean	Fails

second, and "fails" third; but in some the markings were done by numbers 1 to 4. The following table summarizes the points:—

No.	Solubility in water.	Action on the machine.	Caustic to the operator.	Wetting power by observation.	Index fig. of cost, relative only.	Effect.
1	Soluble .	Corrosive	Not	Well	36	Good
2	,, .	Safe	Caustic	Moderately	17	Good
3	,, .	Safe	Not	Well	8	Moderate
4	,, .	Safe	Not	Well	30	Good
5	,, .	Safe	Not	Well	?	Fails
6	,, .	Corrosive	Not	Well	11	Fails
7	Two solutions	Corrosive	Caustic	Well	22	Excessive
8	Soluble .	,,	,,	,,	5	Moderate
9	Two solutions	,,	,,	,,	20	Excessive
10	Soluble .	,,	Not	Moderately	17	Moderate
11	,, .	,,	Caustic	,,	18	Good
12	,, .	,,	,,	Well	7	Fails
13	,, .	,,	,,	,,	10	Fails
14	,, .	,,	,,	,,	5	Good
15	,, .	,,	,,	Moderately	?	Fails
16	,, .	Safe	Not	Well	?	Fails
17	Two solutions	Corrosive	Caustic	,,	11	Moderate
18	No entry. .	—	—	—	—	—
19	Soluble .	,,	Poisonous	Well	2	Fails
20	,, .	,,	Not	Moderately	10	Fails

Recommendations:—

No wash is found to be of such outstanding merit as to warrant an Award of Merit. Had there been any that combined the efficiency of the most caustic with cheapness and ease of application this award would have been recommended.

The following are recommended for "Highly Commended":—

1. Liquid Gishurst Compound—Price's Candle Co.
2. Jeyes' Winter Wash—Jeyes' Sanitary Compounds Co.
4. Morlar Winter Wash—S. P. Charges Co., St. Helens.
11. Voss Winter Wash—W. Voss, Millwall, E.
14. Caustic Soda, 1 lb. to 10 gallons water.

The following are recommended for "Commended":—

3. Cooper's Winter Fluid (V1)—Cooper Nephews, Berkhamsted.
7. Woburn Bordeaux Winter Wash—W. Voss, Millwall, E.
8. Evans' Winter Spray—Evans, Stratford-on-Avon.
9. Woburn Winter Wash—W. Voss, Millwall, E.
10. Voss' Standard Lime Sulphur Solution—W. Voss, Millwall, E.
17. Acme Winter Wash—Acme Chemical Co., Tonbridge.

The following fail:—Nos. 5, 6, 12, 13, 15, 16, 19, 20.

REPORT OF THE TULIP NOMENCLATURE COMMITTEE.

[The following papers on Garden Tulips form the introduction to the full Report of the Tulip Nomenclature Committee which is being published as a separate book and which can be purchased of Messrs. Wesley, 28 Essex Street, Strand, W.C., price 2*s.* 6*d.* (by post 3*s.*). Descriptions are there given of all the Tulips which were grown in the Trials at Wisley, arranged according to the classification outlined here, illustrations of the various types of form and colouring, lists of synonyms, references to the principal literature of the Tulip, and an annotated list of all the names which came under the purview of the Committee.—ED.]

I.—PREFATORY NOTE.

By E. A. BOWLES, M.A., F.E.S., F.L.S.,
Chairman of the Committee.

THE existence and labours of the R.H.S. Tulip Nomenclature Committee were brought about by the rapidly increasing popularity during the last decade of the Garden Tulip. This popularity can be traced to the introduction to commerce of a race of especially sturdy, easily grown, self-coloured or Breeder Tulips, now known as the Darwin Tulips.

The taste for self-coloured Tulips spread rapidly, and old gardens in Flanders, Great Britain, and Ireland were ransacked by enterprising enthusiasts for other races of May-flowering Tulips. Most of these were the castaways of Tulip-raisers and were more often discovered in cottage gardens than elsewhere, and therefore a very heterogeneous set of plants has been gathered together under the name of Cottage Tulips. The vigour of most of the forms of these hitherto neglected strains proved so remarkable that it was not long before large stocks were accumulated, and the May-flowering Tulip was found to be an inexpensive and reliable plant for spring gardening, being quite as suitable for forming masses of colour in large gardens as for associating with other flowers in the smallest garden plot. Many firms of nurserymen were soon engaged in growing and selling them in Holland, Britain, and Ireland; new names were coined for them at such a rate and in so many different centres that a certain amount of confusion arose and the bestowal of more than one name for a variety was no uncommon thing.

Wherever a footpath exists over some open stretch of land, and especially where such a track is still in course of formation, it is generally noticeable that the track takes an indirect route. It may be that a winding course was used for no apparent reasons by the first who made a short cut; or again devious tracks wind away from the main one, due to the individual inclinations of

pedestrians, and a network of paths may result, and need arises for signposts or fences to prevent strangers from losing their way. The opportunities for individual action in the naming of Tulips have been very numerous. Many growers translated foreign names into their own language; for instance 'Kanarienvogel' became 'Canary Bird,' and 'Rêve de Jeunesse' 'Dream.' Others, taking greater liberties, changed the name altogether. 'Salmon Queen' and 'Landelle' represented the same variety and if anyone bought the Tulips named 'Clio,' 'Biscuit,' 'Bronze Queen,' 'Sensation,' and 'Duc d'Orléans,' the flowering season showed he had but one brown variety and not five.

Tulip-growers were beginning to feel the time had come for some action to be taken; a fence was needed to prevent further straying into paths of fancy nomenclature. The climax was reached when a Darwin variety found to be useful for forcing was renamed in the R.H.S. Hall at a Spring show, and eventually appeared in lists at 2*s.* a dozen more under its new name than under the one it had borne for many years.

So in the autumn of 1913 the Council of the R.H.S. issued invitations to the leading growers to send Tulip bulbs to Wisley, and a joint committee of English and Dutch experts was appointed to draw up a scheme of classification that should be useful for Garden purposes, and to settle the synonymy of the varieties bearing more than one name.

This Committee, as originally formed, consisted of Mr. E. A. Bowles (Chairman), Mr. E. Krelage (Vice-Chairman), and Messrs. J. de Graaff, T. Hoog, Jan Roes, P. R. Barr, C. W. Needham, A. D. Hall, W. T. Ware, G. W. Leak, and the Rev. Joseph Jacob, with Mr. C. C. Titchmarsh as Trials Officer, and later was strengthened by the addition of Mr. R. W. Wallace. Mr. Jacob was deputed to visit Holland and, in conjunction with the Dutch Bulb-growers' Association, prepare a preliminary list of synonyms, and the Committee met at Wisley in April and again in May, both in 1914 and 1915, to consider the Early and May-flowering varieties while in full bloom.

It is a matter of great regret that, owing to the War and the consequent difficulty of travelling between Holland and England, the Committee was deprived of the valuable help of its Dutch members at their Wisley meetings in 1915.

However, the lists of names were revised in Holland, and much valuable assistance was kindly afforded.

These lists alone will show the magnitude of the work before the Committee, and it would have been quite impossible to have examined and classified so many varieties, especially at the Conference held on May 13 and 14, 1915, in the R.H.S. Hall, but for the untiring zeal and willing co-operation of all those engaged in the work.

The thanks of the Committee are due to the donors of bulbs for the Trial, viz. Messrs. The Anglesey Bulb-Growers' Association, Llanfair, Isle of Anglesey; Barr & Sons, Covent Garden, London;

R. H. Bath, Wisbech; Gebroeders Bijvoet, Haarlem; W. Blom & Sons, Haarlem; G. Bony, Clermont Ferrand, France; J. Carter, Raynes Park, S.W.; A. Dawkins, King's Road, Chelsea; De Graaff Bros., Leiden; Hogg & Robertson, Dublin; Rev. J. Jacob, Whitchurch, Salop; Jefferies & Son, Cirencester; C. Kieft & Sons, Limmen, nr. Haarlem; E. H. Krelage & Son, Haarlem; J. R. Pearson & Sons, Lowdham; Polman Mooy, Haarlem; A. Roozen & Son, Haarlem; W. Rowlands & Co., Liverpool; W. Ruijnok & Sons, Hillegom; Gerrit Segers, Lisse; Van der Schoot & Son, Hillegom; Van Meerbeck & Co., Hillegom; J. Van Til Jshon, Hillegom; Van Tubergen, jr., Haarlem; Van Waveren & Son, Hillegom; Wallace & Co., Colchester; The Wargrave Plant Farm, Liverpool Street, E.C.; and E. H. Wheadon & Sons, Guernsey; to all concerned with the growing of the plants at Wisley; and especially to Mr. Titchmarsh, the Trials Officer, who made the notes on the growing flowers, superintended the collection of the immense number of cut blooms sent from Wisley to the Hall for the Conference, helped in their grading as to colour, and, with the assistance of the students, Messrs. A. T. Rudge, R. Wightman, N. K. Gould, and P. Greenway, recorded the place in the colour arrangement assigned to each variety, in itself a very heavy piece of work, and also drafted the descriptive report, faithfully embodying the decisions of the Committee at their many meetings.

II.—INTRODUCTION TO CLASSIFICATION OF GARDEN TULIPS.

By A. D. Hall, M.A.

The garden Tulip began to be cultivated in Western Europe towards the middle of the sixteenth century. It came to us from the Turks, with whom it had already been for a long time in cultivation. It is supposed to have originated near Baghdad, and Turkish manuscripts of the fourteenth century are known in which many varieties possessing the special characteristics of the modern flower are enumerated. When the Tulip reached Europe it was already made a garden flower, presumably of composite origin, but the sources are quite lost, and none of the species which have latterly been discovered in the East can be fixed upon as the probable parents of the garden flower. A composite origin seems to be indicated not only by the great range of variation, but by the differences in the time of flowering which tend to segregate garden Tulips into two main groups flowering with us at intervals of nearly a month, by the presence or absence of yellow pigment, and by the occasional occurrence of flowers possessing a strong scent like that of *T. sylvestris*. A genetic classification of the garden Tulips thus becomes impossible with our ignorance of origins, and the only other scientific basis remaining would be one founded upon colour. Four sources of colour may be traced. Firstly, in nearly all Tulips the ovary is surrounded by a central blotch, formed by the lower portions of each petal and approximating to a circle in shape, of a different colour from the rest of the flower. This *base* is deep blue or black in many forms, but it varies enormously in intensity, and may be entirely absent, so as to leave a circle of pure white or yellow. Only in a few of the true white or yellow selfs is the base indistinguishable from the rest of the petal. The shape and extent of the base may also vary considerably, though it is always symmetrical. In speaking of the colour of the Tulip the base is not taken into account. Secondly, the Tulip possesses a sap pigment, located in the cells of the mesophyll only. This pigment may be white or yellow, and it is, except for the basal colour, the only one present in the true white or yellow selfs. Thirdly, there is present in the epidermis of many Tulips an anthocyanin pigment, which varies through all shades of rose, red, and purple. That this anthocyanin pigment is confined to the epidermis may be easily ascertained by stripping the skin from the upper and lower surfaces of any garden Tulip other than the self yellows or whites, when the colouring will be found to have come off with the skin. This anthocyanin pigment tends to become a little more intense

and to change a little in the direction of purple as the individual bloom ages. If it is superimposed upon white mesophyll it becomes the typical colour of that Tulip; superimposed upon a yellow ground it forms the true scarlets, oranges, and light and dark browns, which characterize the Tulips called 'Bizarres.' Lastly, there is in some Tulips a second yellow pigment, related, however, to the anthocyanins and present in the epidermis alongside of the normal red or purple. This gives the flower a flushed or "shot" effect, often very beautiful. This latter yellow pigment bleaches rapidly, and may even disappear as the bloom ages.

One other colour property of the Tulip, a very special one, must be dealt with here: that is, the process known as "breaking." When a Tulip seedling first blooms, if it contains any anthocyanin pigments, *i.e.* red or purple, that colour will be uniformly diffused all over the surface of the segments, and the result is a self-coloured flower (save for the base) known as a "breeder." This bulb and those which arise from offsets in succeeding years remain similarly breeders, but sooner or later some, and doubtless eventually all, will undergo a remarkable change, known as "breaking." In the broken flower the anthocyanin pigment is no longer diffused all over the surface, but is segregated into stripes up the middle of each segment or fine featherings upon its edges. Often the shade changes somewhat on breaking; as a rule it becomes more intense. The offsets from a bulb that has thrown a broken flower will always be broken. As far as is known, reversion to the breeder state never takes place; though the markings of broken colour, which vary considerably in shape and distribution from year to year, may with age almost overspread the whole segment, still these heavy broken flowers are always to be distinguished from the true breeders. Breaking is accompanied by other changes in the plant. The leaves generally show a distinct mottling in the green; the stem possesses markings of anthocyanin pigment; the size, height, and vigour of the plant are reduced, and it does not throw offsets so freely. The cause of breaking remains unknown; change of soil, a hot and dry situation accelerate it, but we are acquainted with no method of preventing it. It is a property of all garden Tulips containing the anthocyanin pigment, *i.e.* of all except the white and yellow selfs.

This property of breaking adds greatly to the difficulty of classifying Tulips for garden purposes; the breeder and the broken or rectified flowers arising from it are so distinct that their common origin, indeed identity, would not be suspected, and they subserve quite different purposes in the garden. Hence a scientific classification based upon colour becomes as impossible as one based upon origin, and the Committee has fallen back upon a purely empirical classification based upon garden convenience alone. This aims at bringing into the same class flowers which "match" and possess similar habits, such as time of flowering, style of growth, colour, and shape. As a rule, flowers in the same class will be more nearly related than

flowers in different classes, though varieties of common origin may have to go into different classes, and some varieties have to be placed rather arbitrarily on one side or other of the dividing line.

The classification begins by dividing the garden Tulips into early and late flowering, in practice a good division, though one or two intermediate varieties, like 'Le Rêve,' exist and others may be expected. Certain races like the 'Van Thols' may be distinguished among the earlies; some of them break, and quite a number of double forms exist.

Turning to the late or May-flowering Tulips, the main groups that have been adopted are Breeders, Broken, and Cottage Tulips, with minor groups for the Doubles and the Parrot Tulips.

The Breeders or self-coloured Tulips have already been defined. Though they all originate from a common stock and have much in common, they are subdivided into three sections, Dutch, English, and Darwins.

The Dutch represent the old parent stock; they show all shades of rose and purple (called 'Bybloemen') which have white grounds, and again all shades of scarlet and brown, the 'Bizarres,' which possess a yellow ground. The bases may be of any shade of blue down to pure white; the form, sometimes a true cup, is generally egg-shaped when not fully expanded, with somewhat long and even pointed petals.

The English Tulips were segregated from the original Dutch stock during the early years of the nineteenth century by the labours of the English florists who insisted and refined upon certain points of excellence that had already been recognized by the Dutch florists. The segments must be broad and rounded and open to a true cup, approximately a hemisphere; the colours are generally clearer and brighter than those of the Dutch breeders, and the base must always be clean white or yellow without any trace of blue. They are subdivided into 'Roses' (all shades of pink and rose), 'Bybloemen' (purple and violet), both of which possess white grounds and bases, and 'Bizarres' (various shades of scarlet and brown) with yellow grounds and bases. The other distinctive properties of the English Tulip are seen only in the broken state.

Somewhere, it is believed in Flanders, another race was segregated from the original Dutch stock and was introduced into commerce in 1899 by Krelage under the name of 'Darwin Tulips.' They possess a stronger constitution than the original stock, grow taller, and have larger flowers of great substance. The shape is also characteristic; the flower segments spring at right angles from the stem and turn again at right angles to form the cup, so that the whole flower possesses a distinctive, squarely-built profile (figs. 81, 82). Among the Darwins the yellow ground has been eliminated, so that only shades of rose and purple are recognized. The base may be any shade of blue down to pure white.

To the three classes of breeders, Dutch, English, and Darwins, correspond three classes of broken Tulips, for all members of this great group possess the property of breaking. The Dutch broken

Tulips usually show considerable irregularity of marking, with streaks and splashes of rose or purple upon a white ground (Bybloemen) or of scarlet and brown upon a yellow ground (Bizarres).

The English florists insist upon complete distinctness and regularity of marking in the English broken Tulips (fig. 83); they distinguish two types: the "feathered" flowers, in which the marking is confined to a fine pencilling upon the edges of the petals, and "flamed" flowers, which possess a branching beam of colour up the centre of the petal in addition to the feathering upon the edges. Unfortunately, as yet, only a few varieties mark truly from year to year.

The broken Darwins, known as "Rembrandt Tulips," are even more irregularly marked than the Dutch; they generally show two shades of colour upon a white ground—splashes of the lighter breeder colour with irregular streaks of a darker shade.

The Cottage class is nothing more than a convenient gathering ground for a number of Tulips from the same general stock which could not be placed in the florist's classes, but which were sufficiently attractive to be kept for garden decoration. It includes the true selfs, white and yellow, which possess no anthocyanin pigment and never break. It also includes races which open with a narrow edge of red upon a white or yellow ground, but as the flower ages the red extends until it flushes over the whole bloom. Among the other sections in the Cottage Tulips is one including various shades of red and crimson, and another including the shades of scarlet, orange, or brown. It should be remembered that all flowers of rose-red, crimson, and purplish shades possess a white ground colour, whereas the true scarlets and all brown shades are due to the same red or purple colours superimposed upon a yellow ground. Lastly we have a group of varying and indeterminate colours, in which the red or purple pigment is "shot" with a yellow shade of varying intensity. Again, there are broken classes for all the Cottage Tulips except the true selfs. Form varies greatly among the Cottage Tulips, and we may distinguish four types: (1) the true cup, as in 'Bouton d'Or' (fig. 84); (2) the long pointed form, often showing a distinct waist, as in 'Mrs. Moon' (fig. 85); (3) the form with pointed reflexing segments, giving the flower an outline resembling the heraldic fleur-de-lys, as in *retroflexa* (fig. 86); (4) the form that is in outline much like a long egg, as in 'John Ruskin' (fig. 87).

The Double Late Tulips need no definition. The Parrots include a few varieties with cut and laciniated petals, often showing blotches of green unpigmented tissue. The Parrots are usually marked with scarlet or brown upon a yellow ground, but a few are known with white grounds. As a rule they have weak stems and do not bloom very freely. As a final group we have to bring together all the true species, not that they possess necessarily anything in common, save the property of breeding true, but simply for convenience. It should be noted that many of the so-called species, which have Latin names in the catalogues, are really garden forms, and are mostly included in

FIG. 81. DARWIN TULIP 'BLEU AIMABLE.'

[To face p. 240

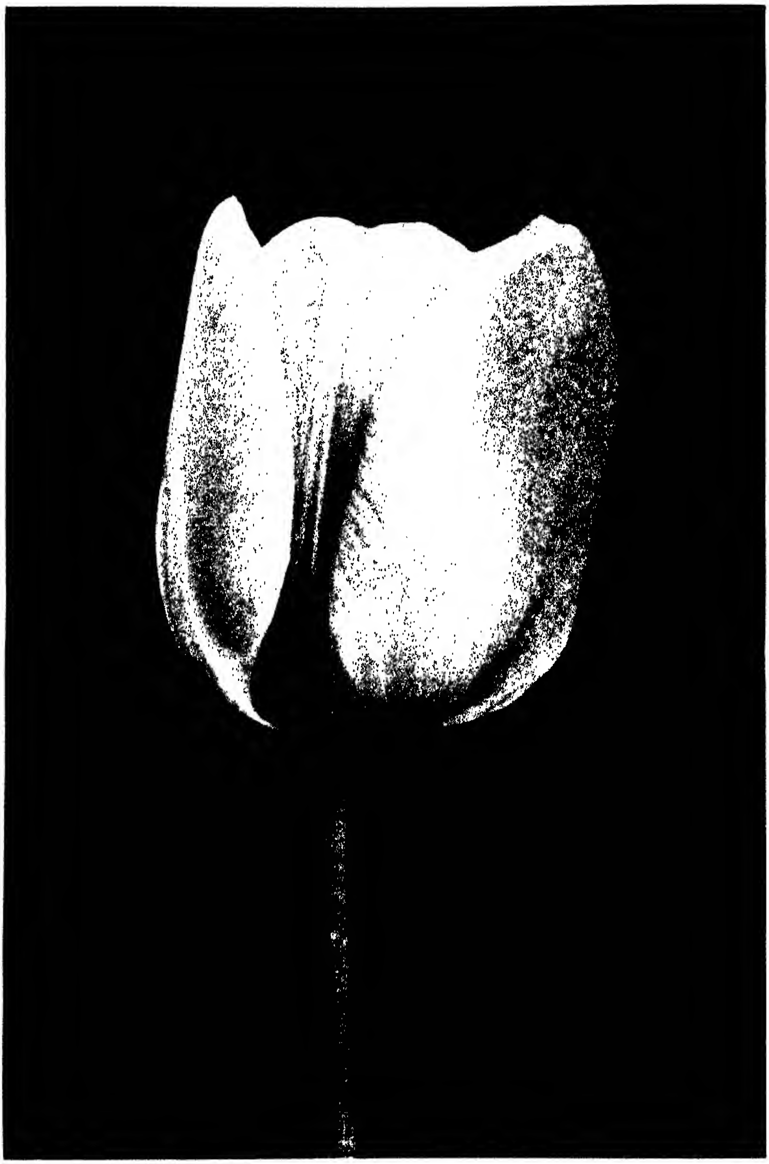

FIG. 82.—DARWIN TULIP 'CLARA BUTT.'

the Cottage section. Among such varieties are *Gesneriana*, *vitellina*, *fulgens*, *retroflexa*, &c.

Synonyms abound among garden Tulips. Sometimes this has been due to accidental or deliberate re-naming; sometimes a broken form has been given a name different from that of the breeder form. The Committee has endeavoured to preserve the best-known name and record all the synonyms, and in the case of broken flowers to indicate the breeders from which they sprang.

III.—SCHEME FOR THE CLASSIFICATION OF GARDEN TULIPS.

With List of Selected Varieties.

Section I.—Early Flowering.

Definition: Of garden origin, dwarf habit, and in full flower before the end of April.

Subsection A.—Duc van Thol Tulips.

Definition: Very early Tulips, rarely exceeding six inches in height. [Suitable for pot cultivation only.]

Subsection B.—Singles.

a. White.
For Pots: Pottebakker White, Lady Boreel, Princesse Hélène.
For Bedding: Washington, Lady Boreel, Princess Marianne, Pottebakker White, White Swan (late), Jacoba van Beyeren.

b. White and yellow.
For all purposes: Brunhilde, Princess Ida.

c. White, flushed pink.
For Pots: Rose of Holland, Queen of the Netherlands, La Reine.
For Bedding: Rose of Holland, La Reine.

d. Pink on white.
For Pots: Rose Gris-de-lin, Rose Tendre.
For Bedding: Rosamundi Huyckman, Alice Roosevelt, Rose Gris-de-lin.

e. Deep rose and white.
For Pots: Rose Luisante, Le Matelas, De Vlieger.
For Bedding: Pink Beauty, Cottage Maid, Wapen van Leiden, Princess Wilhelmina, De Vlieger.

f. Deep rose.
For Pots: Jenny, Stanley, Van Berghem.
For Bedding: Jenny, Stanley, Cramoisi Royal.

g. Cerise.
For Pots: Aelbert Cuyp, Joost van den Vondel, Paul Moreelse.

For Bedding: Joost van den Vondel, Couleur Ponceau, Mrs. Langtry, Aelbert Cuyp.

h. Crimson.

For Bedding: Bacchus.

i. Scarlet.

For Pots: Vermillon Brillant, La Grandeur, Orange Brillant, Cramoisi Brillant.

For Bedding: Vermillon Brillant, Dusart, Sir Thomas Lipton, Artus, Couleur Cardinal.

j. Orange-scarlet.

For Pots: Prince of Austria.

For Bedding: Prince of Austria, Grace Darling.

k. Orange.

For all purposes: Fred. Moore, Thomas Moore.

l. Orange and yellow.

For Pots: De Wet, Cardinal Rampolla.

For Bedding: De Wet, Cottage Boy, Cardinal Rampolla, Golden Lion.

m. Yellow.

For Pots: Yellow Queen, Mon Trésor, Prince de Ligny.

For Bedding: Yellow Globe, King of the Yellows, Goldfinch, Prince de Ligny, Golden Queen, Royal Sovereign.

n. Primrose.

For Pots and Bedding: Primrose Queen.

o. Purple.

For Pots: Van der Neer, President Lincoln, Molière.

For Bedding: Van der Neer, Wouwerman, President Lincoln, Molière.

p. Red and yellow.

For Pots: Hector, Keizerskroon.

For Bedding: Duchesse de Parme, Hector, Keizerskroon.

q. Purple, edged white.

For Pots: Mrs. Elwes.

For Bedding: Lac Premier, Eleonora, Lac van Rhijn.

r. Striped, white ground.

For Pots: Fabiola, Spaendonck, Admiral Reyniers.

s. Striped, yellow ground.

For Bedding: Golden Bride of Haarlem, Duc d'Autriche.

t. Of other colours.

For Bedding: Enchantress, La Remarquable, Potter.

u. Foliage striped.

For Pots: Rose Luisante, Joost Van den Vondel, Silver Standard.

For Bedding: Yellow Prince, Rose Aplatie.

SUBSECTION C.—DOUBLES.

a. White.
For Pots: Schoonoord, White Salvator Rosa.
For Bedding: Schoonoord, Boule de Neige, Alba Maxima, La Candeur.

b. White, flushed pink.
For Pots: Murillo, Raphael.
For Bedding: Raphael, Parmesiano.

c. Rose.
For Pots: Lady Palmerston, Couronne des Roses, Salvator Rosa.
For Bedding: Virginia, Lady Palmerston, Couronne des Roses.

d. Deep Rose.
For Bedding: Lord Beaconsfield, La Victoire.

e. Cerise.
For Bedding: Queen Emma, Arabella, Rozenkroon.

f. Scarlet.
For Pots: Vuurbaak, Imperator Rubrorum.
For Bedding: Vuurbaak, Imperator Rubrorum, Rubra Maxima, Willem III.

g. Orange and red.
For Pots: El Toreador, Prince of Orange.
For Bedding: El Toreador.

h. Red, edged yellow.
For Pots: Tournesol.
For Bedding: Pieneman, Titian, Gloria Solis.

i. Yellow and orange
For Pots and Bedding: Couronne d'Or, Yellow Tournesol

j. Yellow.
For Pots: Mr. van Tubergen.
For Bedding: Mr. van Tubergen, Velasquez.

k. Primrose.
For Pots and Bedding: Safrano.

l. Puce.
For Pots and Bedding: Lac van Haarlem, Turban Violet.

m. Of other colours.
For Pots: Harlequin.

n. Foliage striped.
For Pots: Tournesol.

FIG. 83.—ENGLISH TULIP 'SIR JOSEPH PAXTON.'

[To face p. 244.

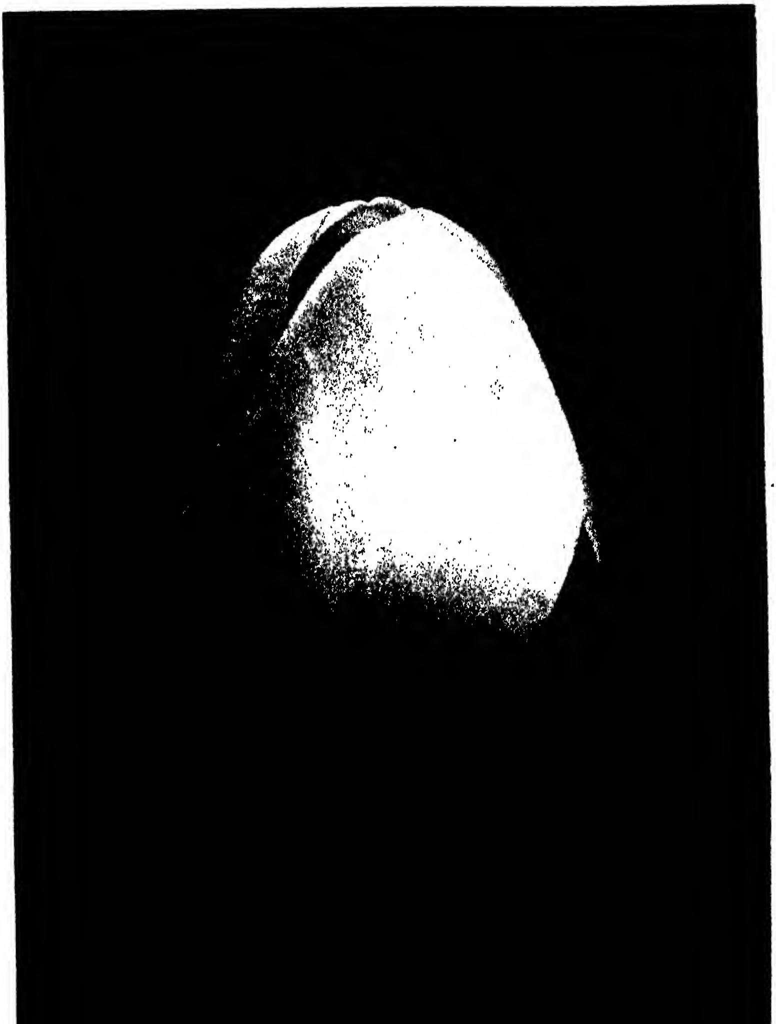

FIG. 84.—COTTAGE TULIP 'BOUTON D'OR.'

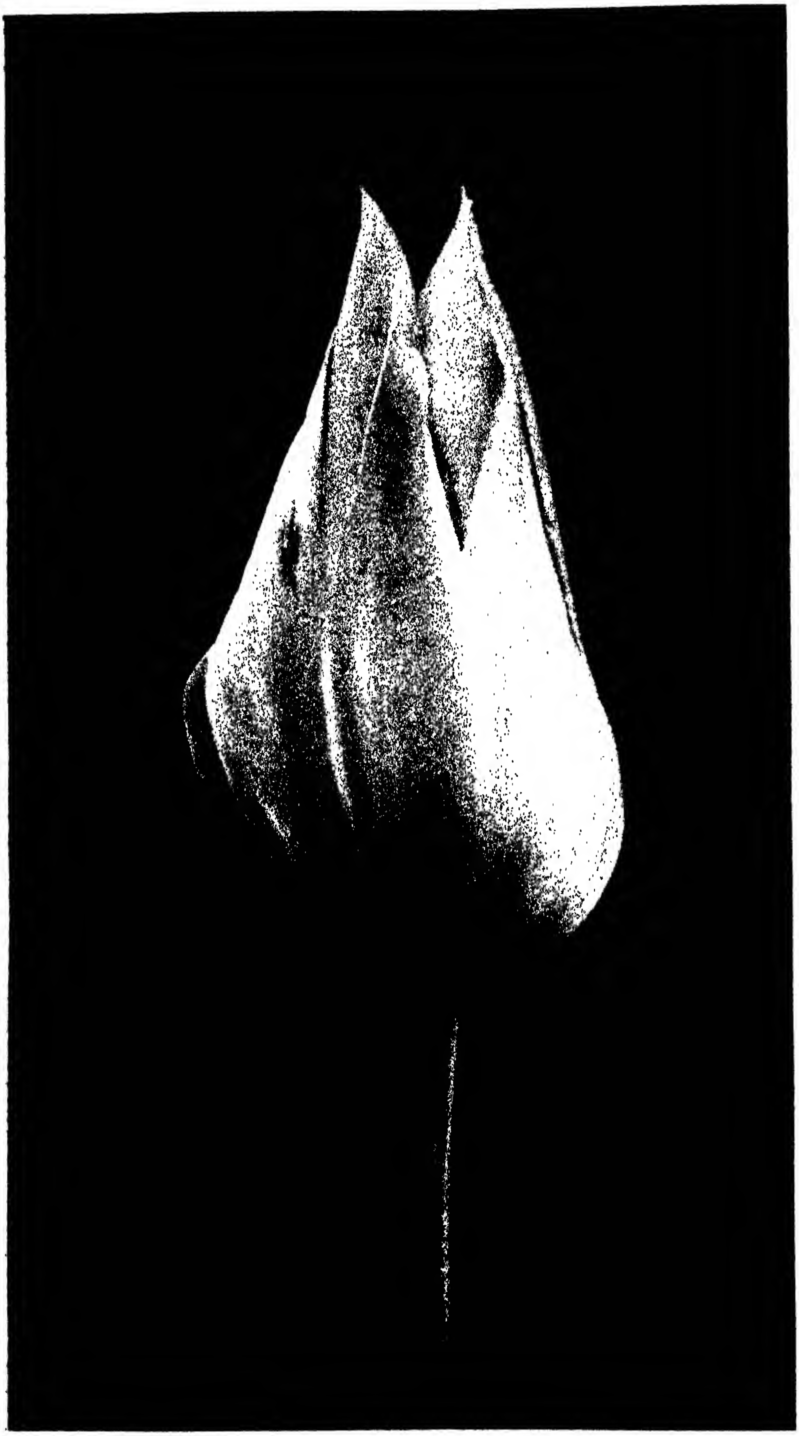

FIG. 85.—COTTAGE TULIP 'MRS. MOON.'

[To face p. 245.

SECTION II.—MAY-FLOWERING.

Definition: Of garden origin, mostly of tall and robust habit, and usually flowering after May 1.

SUBSECTION A.—COTTAGE VARIETIES.

Definition: All Tulips which do not fall within the other classes. The colours may be pure white or yellow, all shades of pink, crimson to purple, orange, and brown, and various "shot" shades, produced by the combination of pink or purple colours on a yellow ground. The shape may be (a) a true cup with rounded segments, (b) a long flower with pointed segments, (c) a long flower with reflexed segments, (*d*) long egg-shaped.

a. White.
Parisian White, Dora.

b. White, edged pink.
Elegans alba, Picotee, Carnation.

c. Cream, flushed pink.
Isabella, Innovation, Pride of Inglescombe.

d. Pink.
Inglescombe Pink, Mrs. Kerrell, Sir Harry.

e. Cerise.
Cassandra, Rosalind, Rose Beauty.

f. Cochineal red.
Gesneriana spathulata, Fulgens, Glare of the Garden.

g. Scarlet.
Scarlet Emperor, Inglescombe Scarlet, Beau Brummell.

h. Orange-scarlet.
Orange King, Grenadier, Boadicea, La Merveille.

i. Yellow.
Inglescombe Yellow, Mrs. Moon, Bouton d'Or, Avis Kennicott.

j. Primrose.
Ellen Willmott, Moonlight.

k. Yellow, edged red.
Cardinal Billiet, Illuminator, Golden Crown.

l. Light bronze.
Jaune d'Œuf, Garibaldi, Yellow Perfection.

m. Dark bronze.
Golden Bronze, Goudvink, Quaintness.

n. Shot.
John Ruskin, Beauty of Bath, The Fawn, Fairy Queen.

SUBSECTION B.—BREEDERS.

Definition : Self-coloured flowers, except as regards the base.

(1) Dutch Breeders.

Definition: Flower oval or cupped, brown, purple, or red, but sometimes bronze; base white or yellow, but generally stained blue or green to blue-black.

a. Roses.

Definition : Pink to red.

May Queen, Charles Dickens.

b. Bybloemen.

Definition: Purple to violet.

Bacchus, Cardinal Manning, Godet Parfait, Velvet King.

c. Bizarres.

Definition: Shades of scarlet, bronze or brown.

Dom Pedro, Louis Quatorze, Panorama, Prince of Orange.

(2) English Breeders.

Definition : Flower forming ⅓ to ½ of a hollow ball when fully expanded; base always white or yellow, without trace of other colour.

a. Roses.

Definition : Rose shades, with white base.

Annie McGregor, Mabel, Mrs. Barlow, Rose Hill.

b. Bybloemen.

Definition : Purple shades, with white base.

Adonis, Elizabeth Pegg, Talisman.

c. Bizarres.

Definition : Brown shades, with yellow base.

Sir Joseph Paxton, Samuel Barlow, Sulphur, Goldfinder.

(3) Darwins.

Definition : Lower portion of flower usually rectangular in outline; segments of good substance; stems strong and tall; colour, shades of purple, red to white, never yellow or brown; base black, blue, or white, or any combination of these colours.

a. Scarlet-vermilion.

Isis, Feu Brillant, Whistler, City of Haarlem.

b. Cochineal red.

Farncombe Sanders, Van Poortliet, Prof. Rauwenhof, Europe.

c. Cerise.
Pride of Haarlem, Prince of the Netherlands, Mattia.

d. Magenta.
William Goldring, Admiral Togo, The International.

e. Light Magenta.
Centenaire, Nauticus, Adèle Sandrock.

f. Rose.
Edmée, Princess Elizabeth, Baronne de la Tonnaye, Venus.

g. Pale Rose.
Psyche, Suzon, Flamingo, Sophrosyne.

h. Salmon-Pink.
Clara Butt, Yolande, Maiden's Blush.

i. Crimson-Maroon.
Marcella, Henner, King Harold, Millet.

j. Maroon-Black.
Fra Angelico, Philippe de Comines, Zanzibar.

k. Purple-Black.
Faust, Zulu, La Tulipe Noire.

l. Purple.
Frans Hals, Marconi, Paul Boudry, Raphael.

m. Violet-Purple.
Valentin, Moralis, The Bishop, Viking.

n. Rosy Purple.
Palissa, Violet Queen, Mrs. Potter Palmer.

o. Rosy Lilac.
Euterpe, Ascanio, Pygmalion.

p. Lilac.
Erguste, Bleu Aimable, Melicette, Rev. H. Ewbank.

q. Lilac, with a lighter edge.
Mauve Clair, Electra, Wally Moes, Nora Ware.

r. Blush.
L'Ingénue, Margaret, Zephyr.

s. Slaty Lilac.
Oliphant, Remembrance, Ronald Gunn.

SUBSECTION C.—BROKEN TULIPS.

Definition: Flowers in which the colour appears in the form of stripes on a lighter ground colour, generally white or yellow.

(1) Broken Dutch.

a. Roses.

Definition : Rose or cerise markings on white ground.

Admiral Kingsbergen, Comte de Vergennes, Henry VIII, Perle Brillante.

b. Bybloemen.

Definition : Violet or purple markings on white ground.

Dainty Maid, Impératrice de Maroc, May Blossom.

c. Bizarres.

Definition : Brown, red, or purple markings on yellow ground.

Cherbourg, Miss Doris Diggle, Trafalgar.

(2) Broken English.

a. Roses.

Definition : Rose markings on white ground.

Annie McGregor, Mabel, Aglaia, Rose Hill.

b. Bybloemen.

Definition : Purple markings on white ground.

Talisman, Adonis, Duchess of Sutherland.

c. Bizarres.

Definition : Brown or black markings on yellow ground.

Samuel Barlow, Sir Joseph Paxton, Dr. Hardy, George Hayward, Lord Stanley.

(3) Rembrandts.

Definition : Broken Darwins.

a. Roses.

Definition : Rose markings on white ground.

Red Prince, Semele, Victor Hugo.

b, Bybloemen.

Definition : Purple markings on white ground.

Françoise d'Amboise, Procles.

(4) Broken Cottage.

a. Roses.

Definition : Rose markings on white ground.

Striped Beauty, Zomerschoon.

b. Bybloemen.

Definition : Purple markings on white ground.

Twilight, Union Jack.

FIG. 86.—COTTAGE TULIP 'RETROFLEXA.'

[To face p. 248.

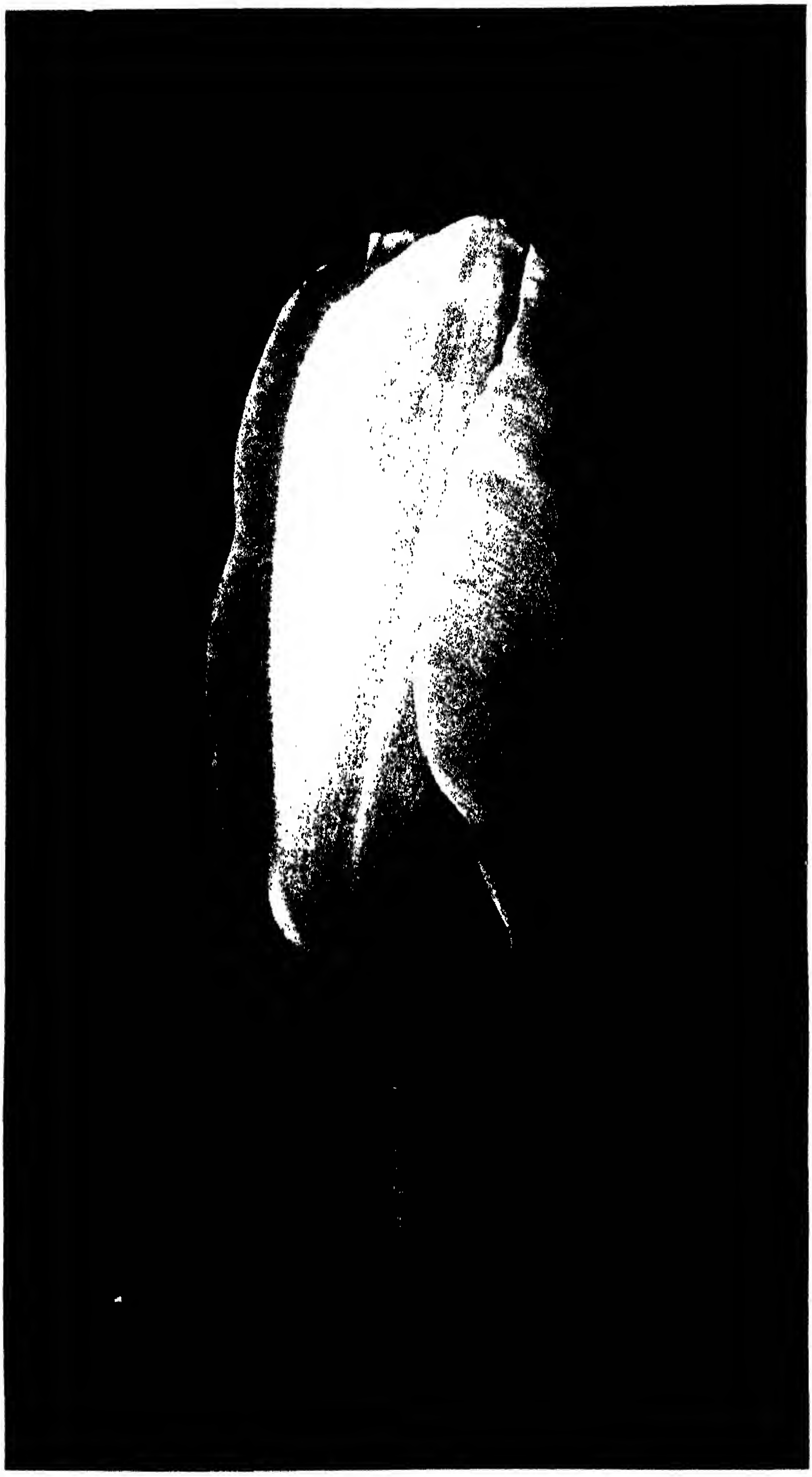

FIG 87.—COTTAGE TULIP 'JOHN RUSKIN.'

c. Bizarres.

Definition: Brown, red, or purple markings on yellow ground.

Chameleon, Gala Beauty, Scotia.

SUBSECTION D.—PARROTS.

Definition: Tulips with laciniate segments.

Amiral de Constantinople, Lutea major, Markgrafen Baden, Crimson Beauty.

SUBSECTION E.—DOUBLES.

Blue Flag, Mariage de ma Fille, Yellow Rose, Rose Pompon.

SECTION III.—SPECIES.

Definition: Tulips which are or have been found wild, and which keep their characteristics under cultivation.

e.g. Clusiana, Greigii, Fosteriana, sylvestris, Batalini.

PHLOXES AT WISLEY, 1915.

REPORT BY C. C. TITCHMARSH, Trials Officer.

DURING the spring of 1914 four hundred and fifty-six stocks of Phloxes were sent to Wisley for trial. Two hundred and seventy-eight varieties were represented, of which three belonged to the Suffruticosa section. Twelve stocks failed to grow, and three were found to be mixed. With the exception of Nos. 381–456, which had only two plants each, there were three plants of each variety.

When received they were planted on well-cultivated ground between the rows of apple and pear trees on the east side of the American garden, the cultivation being under the charge of Mr. W. J. Blakey, Assistant Superintendent. Notwithstanding the dry spring, the plants made excellent growth and flowered well. They were examined by the Floral Committee on July 23 and August 16.

In this Report the plants are grouped in ten sections, under popular colour names. The varieties are arranged in alphabetical order in each section. The Roman numeral which follows each name in the preliminary list indicates the section in which the description of the variety will be found. The measurement given in feet after the description of the plant is its height.

The Committee selected the following varieties as the best in their respective sections:—

CLASS I.—Very good, highly decorative garden plants.

SECTION I.—*Flowers* WHITE.

Europe.
Frau Antonin Buchner.
Lady Grizel.
La Neige.
Tapis Blanc.

SECTION II.—*Flowers* PINK.

Elizabeth Campbell.
Selma.
Météore.

SECTION III.—*Flowers* SALMON.

Aubrey Alder.

SECTION IV.—*Flowers* ORANGE-SCARLET.

Coquelicot.
Georg A. Ströhlein.

SECTION VIII.—*Flowers* VIOLET.

Le Mahdi.
Miss Pemberton.

Section IX.—*Flowers* Mauve.

Antonin Mercié.
Espérance.

Class II.—Good plants, but not so meritorious as those in Class I.

Section I.—*Flowers* White.

Flora Hornung.
Henri Murger.
Joséphine Gerbaux.
Mrs. E. H. Jenkins.
John Forbes.
Miss Bouverie.
Oculata.

Section II.—*Flowers* Pink.

Arthur Ranc.
Panthéon.
Fr. Grimm.
Sheriff Ivory.

Section III.—*Flowers* Salmon.

Aurora.
J. E. Suckling.
William Robinson.
Fort de France.
Seduction.

Section IV.—*Flowers* Orange-Scarlet.

Baron von Dedem.
Dr. Königshofer.
William Scott.
Braga.
General van Heutsz.
Lady Satanella.

Section V.—*Flowers* Ruby-Red.

Aegir.

Section VI.—*Flowers* Rose.

Champignol.
Helmuth Hirth.
L'Aiglon.
Sergent Lovy.
Goliath.
Jules Sandeau.
Rose Queen.
Viktor Stössel.

Section VII.—*Flowers* Purple.

Reichsgraf von Hochberg.

Section VIII.—*Flowers* Violet.

Derviche.
Widar.
Miss Pemberton.

Section IX.—*Flowers* Mauve.

Distinction.
Lady Tate.
Jules Cambon.
Pharaon.

Section X.—*Flowers* Flushed.

Daniel Lesueur.
Paul Bert.

List of Varieties.*

[In the following list Nos. 1–17 were received from Messrs. Pfitzer, of Stuttgart; 18–20 from H. Aldersey, Esq.; 21–92 from Messrs. W. Wells, junr., of Merstham; 93–162 from Messrs. Barr, of King Street, Covent Garden, W.C.; 163–267 from Mr. James Box, of Lindfield; 268-380 from Messrs. Forbes, of Hawick; 381–456 from Messrs. H. J. Jones, of Lewisham.]

1. †Rosenberg.
2. †Asien.
3. Europe. I.
4. Geheimrat Dr. Königshofer. IV.
5. Elizabeth Campbell. II.
6. Frau Grimm. II.
7. †Kappelberg.
8. Australien. VII.
9. Minerva. II.
10. Hayo Eilers. X.
11. Elektra. VI.
12. Hortense. II.
13. Garteninspektor Krauss. IX.
14. Frau Eliz. Krehl. III.
15. Helmuth Hirth. VI.
16. Hans Vollmoller. IX.
17. Viktor Stössel. VI.
18. Squire Aldersey. III.
19. Uncle Tom. VI.
20. Tapis Blanc. I.
21. Santos Dumont. VI.
22. Belvédère. VI.
23. Asia. VI.
24. Fort de France. III.
25. †Pierre Loti.
26. Geoffroy St. Hilaire. IX.
27. Coquelicot. IV.
28. Salome. I.
29. Baron von Dedem. IV.
30. Lady Satanella. IV.
31. General van Heutsz. IV.
32. Émile Michel. VI.
33. Béranger. II.
34. Loki. III.
35. Avalanche. I.
36. Aquilon. V.
37. Distinction. IX.
38. Richard Strauss. VIII.
39. Artaxis. IX.
40. Selma. II.
41. Embrasement. IV.
42. Belle Alliance. I.
43. ||John Forbes.
44. Annie Laurie. II.
45. Comet. VI.
46. Dennis Peuch. VIII.
47. Arthur Ranc. II.
48. Daniel Lesueur. X.
49. The Dove. I.
50. Cameron. II.
51. Rose Queen. VI.
52. Mme. Paul Dutrie. X.
53. Amphitryon. X.
54. Gloire de Maroc. VII.
55. Esclairmonde. IX.
56. Paul Fliche. IX.
57. Frau Antonin Buchner. I.
58. J. E. Suckling. III.
59. Iris. VIII.
60. Tragédie. V.
61. Ironie. II.
62. Rosa Beera. VI.
63. Mrs. A. Baker. VI.
64. Feodora. X.
65. Elizabeth Campbell. II.
66. Lady Beaconsfield. X.
67. †Africa.
68. Aubrey Alder. III.
69. Champs Élysées. VII.
70. Antonin Mercié. IX.
71. Bourgmestre Ritter. II.
72. Atala. IX.
73. Le Mahdi. VIII.
74. Espérance. IX.
75. Eugen Feyen. IX.
76. Marquis de St. Paul. VI.
77. Guillaume Dulinge. VII.
78. Lumineau. VI.
79. Alliance Russe. VI.
80. Éclaireur. VII.
81. Derviche. VIII.
82. Crépuscule. IX.
83. Admiral Cambon. VII.
84. King Edward. V.
85. Flora Hornung. I.
86. Mrs. Oliver. II.
87. Sheriff Ivory. II.
88. Charles Dickens. IV.
89. Eugène Danzanvilliers. IX.
90. Rijnstroom. VI.
91. Caran d'Ache. VI.
92. Violetta. IX.
93. Panthéon. VI.
94. Wm. Robinson. III.
95. Antonin Mercié. IX.
96. Goliath. VI.
97. Frau Antonin Buchner. I.
98. Lady Grizel. I.
99. Francillon. IX.
100. Mrs. Miller. VI.
101. Gruppenkönigin. II.
102. Tragédie. V.
103. Lady Diana. VII.
104. Eugène Danzanvilliers. IX.
105. Champignol. VI.
106. Freifräulein G. von Lassberg. I.
107. Mrs. Oliver. II.
108. Aglaë Adanson. I.
109. General van Heutsz. IV.
110. Violetta. IX.

* See note, p. 117. † These stocks failed. || Not true to name.

111. Frau Antonin Buchner. I.
112. Fort de France. III.
113. Georg A. Ströhlein. IV.
114. Lady Grey. VIII.
115. Panthéon. VIII.
116. Lady Hermione. II.
117. Coquelicot. IV.
118. Cendrillon. X.
119. Snowdon. I.
120. Paul Martin. II.
121. Javanaise. X.
122. Etna. IV.
123. Selma. II.
124. Elizabeth Campbell. II.
125.†Rheingau.
126. Jungfrau. VI.
127. Cœur de Lion. VII.
128. Henri Murger. I.
129. Tapis Blanc. I.
130. Europe. I.
131. Baron von Dedem. IV.
132. Iris. VII.
133. Crépuscule. VIII.
134. Tapis Blanc. I.
135. Rijnstroom. VI.
136. Le Mahdi. VIII.
137. Spirite. X.
138. De Bois. VI.
139. Lady Molly. II.
140. Dr. Charcot. VIII.
141. Jules Cambon. IX.
142. Lady Satanella. IV.
143. Atala. IX.
144.†Lady Dolly.
145. Pharaon. IX.
146. Éclaireur. VII.
147. Sergent Lovy. VI.
148. Béranger. II.
149. Mme. Paul Dutrie. X.
150. Esclairmonde. IX.
151. Jocelyn. IV.
152. Freia. X.
153. Maspero. II.
154. Météore. II.
155. Liberté. III.
156. Paul Bert. VIII.
157. De la Croix. IX.
158. Reichsgraf von Hochberg. VII.
159. Multiflore. VII.
160. Derviche. VIII.
161. L'Aiglon. VI.
162.†Dr. Hornby.
163. Europe. I.
164. Wolfgang von Goethe. VI.
165. Violetta. IX.
166. Gartendirektor Broderson. VI.
167. Emmanuel Arends. VIII.
168. Panthéon. VI.
169. *nana coerulea*. VIII.
170. Gloire de Maroc. VI.
171. Duguesclin. X.
172. Le Mahdi. VIII.
173. Braga. IX.
174. Robert Blos. IV.
175. François de Neufchâtel. VII.
176. Souv. de Mme. Paul Leturque. VI.
177. Fort de France. III.
178. Arthur Ranc. II.
179. Rosenberg. VII.
180. Rijnstroom. VI.
181. Frühlicht. II.
182. Embrasement. IV.
183. Antonin Mercié. IX.
184. Bacille. VI.
185. Perle Rose. VI.
186. Gustave Nadaud. X.
187. Coquelicot. IV.
188. Freifräulein von Lassberg. I.
189. Tapis Blanc. I.
190. Daniel Lesueur. X.
191. Frau Antonin Buchner. I.
192. Joséphine Gerbaux. I.
193. Lope Cortes. X.
194. Baron von Dedem. IV.
195. Eugen Feyen. IX.
196. Anna Regina. I.
197. Mrs. E. H. Jenkins. I.
198. Elizabeth Campbell. II.
199. Aurora. III.
200. Météore. II.
201. Goliath. VI.
202. Emanuel de Rouge. VII.
203. Asia. VI.
204. Béranger. II.
205. Torpilleur. VI.
206. Col. Mangin. III.
207. Frau Dr. Ackernecht. II.
208. Magician. I.
209. Savorgnan de Brazza. VII.
210. René Bazin. VI.
211. General von Heutsz. IV.
212. Clara Benz. VI.
213. La Neige. I.
214. Loki. III.
215. Hodur. II.
216. Selma. II.
217. Louis Botha. VI.
218. Donar. III.
219. Crépuscule. IX.
220. Frau Rich. Volpelius. I.
221. Caran d'Ache. VI.
222. Widar. VIII.
223. Admiral Campion. VI.
224. Harry Pfleiderer. I.
225. Rheingau. X.
226. Kücken. II.
227. White Éclaireur. I.
228. Frau Antonin Buchner. I.
229. Sheriff Ivory. II.
230. Mrs. John Harkness. III.
231. Le Prophète. IX.
232. Neptune. VI.
233. Mme. Paul Dutrie. X.
234. Albert Leteau. II.
235. Comète. VI.
236. Éclaireur. VII.
237. Pharaon. IX.
238. *Étienne Lamy. III.*
239. Albert Vandel. VIII.
240. Jules Sandeau. VI.
241. Ostara. II.
242. Dr. Königshofer. IV.
243. Reichsgraf von Hochberg. VII.
244. Toreador. III.

† These stocks failed.

245. Dr. Charcot. VIII.
246. Walter Wright. VII.
247. Artaxis. IX.
248. Gruppenkönigin. II.
249. Jules Cambon. IX.
250. Georg A. Ströhlein. IV.
251. Flora Hornung. I.
252. Gretchen Goos. VII.
253. Iris. VIII.
254. Elizabeth Campbell. II.
255. Jules Sandeau. VI.
256. Frau Antonin Buchner. I.
257. Baron von Dedem. IV.
258. Rijnstroom. VI.
259. Lofna. IX.
260. Reichsgraf von Hochberg. VII.
261. General von Heutsz. IV.
262. Gruppenkönigin. II.
263. Dr. Königshofer. IV.
264. Goliath. VI.
265. Europe. I.
266. Selma. II.
267. Rosamundi. II.
268. Rijnstroom. VI.
269. Frau Antonin Buchner. I.
270. James Hamilton. VII.
271. Gruppenkönigin. II.
272. Iris. VIII.
273. Harry Pfleiderer. I.
274. J. C. Meek. VII.
275. John Forbes. II.
276. John Lamont. II.
277. Hélène Vacaresco. I.
278. General von Heutsz. IV.
279. Flora Hornung. I.
280. Lady Glenconner. VI.
281. Geoffroy St. Hilaire. X.
282. Hermann Ostertag. IV.
283. Florrie Cooper. VI.
284. Georg A. Ströhlein. IV.
285. Favourite. X.
286.†F. J. Marshall.
287. G. Rodenbach. II.
288. Felicity Rogers. VI.
289.†Emile Krantz.
290. Eminence. VII.
291. Eugène Danzanvilliers. IX.
292. Erich Ruger. VII.
293. Embrasement. VI.
294. Etna. IV.
295. Daniel Lesueur. X.
296. Émile Duclaux. I.
297. De Lacépède. VII.
298. Duke of Marlborough. III.
299. E. Boissier. IX.
300. Elizabeth Campbell. II.
301. De Mirbel. III.
302. Contradiction. VII.
303. Delicies. II.
304. Dr. Schleicher. VII.
305. Coquelicot. IV.
306. ||Dainty.
307. Aurora. III.
308. C. de Boufflers. VIII.
309. Comtesse de Jarnac. II.
310. C. A. Hope. VIII.
311. Baron von Dedem. IV.
312. Coccinea. V.
313. Cameron. II.
314. Lady Tate. IX.
315. La Perle. I.
316. Lady Menzies. II.
317. Marchioness of Tullibardine. III.
318. Lady Northcote. IX.
319. John McLeod. VI.
320. Arthur Ranc. II.
321. La Neige. I.
322. Adonis. III.
323. Border Beacon. III.
324. A. J. Ashmore. X.
325. Lady Minto. III.
326. Lady Rayleigh. IX.
327. Albert Harwood. VI.
328. Lady Miller. III.
329. Lady Tweeddale. X.
330. Mrs. Grenander. VII.
331. William Scott. IV.
332. ||Blenheim.
333. La Fraîcheur. IX.
334. Joseph Chamberlain. VII.
335. Ary Scheffer. VII.
336. Auguste Raffet. VII.
337. Sosie. IX.
338. Violetta. IX.
339. W. J. Marlow. I.
340. Theresa. VI.
341. Reichsgraf von Hochberg. VII.
342. ||Thomas Hay.
343. Sarabande. IX.
344. Sergent Lovy. VI.
345. Tapis Blanc. I.
346. Sir William Carrington. IV.
347. S. de Brazza. VII.
348. Sheila. VI.
349. Poussin. I.
350. Paul Fliche. IX.
351. Roger Marx. III.
352. Progress. VI.
353. Seduction. III.
354. Printemps. VI.
355. Mrs. Oliver. II.
356. Muriel Rogers. II.
357. *paniculata*. IX.
358. *paniculata alba*. I.
359. Obergärtner Mack. VI.
360. Paul Bert. VIII.
361. Mont Pelée. IV.
362. Mrs. Derring. III.
363. Mrs. Aberdeen. VI.
364. Miss Willmott. VI.
365. Mounet Sully. IV.
366. Mrs. Graham Wigan. VII.
367. Marvel. VIII.
368. Mistral. IX.
369. Mhairi. VI.
370. Mentmore. VI.
371. Miss Bouverie. I.
372. Miss Pemberton. VIII.
373. Marchioness of Linlithgow. II.
374. Liberté. III.
375. Mme. Paul Dutrie. X.
376. Mme. H. Carvalho. X.
377. Mark Twain. VII.
378. Marjolaine. X.

† These stocks failed.

|| = mixed stock.

379. Lizette. X.
380. Le Vengeur. VII.
381. Georg A. Ströhlein. IV.
382. Arthur Ranc. II.
383. Paul Ehmann. II.
384. Mrs. A. Baker. VI.
385. Etna. IV.
386. Embrasement. IV.
387. Widar. VIII.
388. Éclaireur. VII.
389. Braga. IX.
390. Europe. I.
391. Jules Cambon. IX.
392. Aegir. V.
393. Rose Queen. VI.
394. Baron von Dedem. IV.
395. Clara Benz. VI.
396. Boule de Feu. III.
397. Violetta. IX.
398. General van Heutsz. IV.
399. M. Graham. VI.
400. Mme. Paul Dutrie. X.
401. Joséphine Gerbaux. I.
402. Dr. Charcot. VIII.
403. Bacille. VI.
404. Beauty of Warwick. IX.
405. Mrs. R. Goodwin Golby. IX.
406. Béranger. II.
407. Mrs. W. Wraite. X.
408. Wolfgang von Goethe. VI.
409. Royal Purple. VII.
410. *nana coerulea*. VIII.
411. Marchioness of Tweeddale. I.
412. Gartendirektor Broderson. VI.
413. The Queen. I.
414. Frank Bouskill. VI.
415. Striatum. I.
416. Oculata. I.
417. Seedling 116. VI.
418. Seedling 125. I.
419. Mrs. R. C. Pulling. II.
420. Rijnstroom. VI.
421. Mounet Sully. IV.
422. Belvedere. VI.
423. Miss Emma Roope. IX.
424. Seedling 123. VI.
425. Aurora. III.
426. Seedling 136. VI.
427. Seedling 135. I.
428. F. J. Wells. IV.
429. Mrs. G. F. Richardson. VI.
430. Kücken. II.
431. Distinction. IX.
432. Elizabeth Campbell. II.
433. Widar. VII.
434. Sinbad. IX.
435. Seedling 128. I.
436. Seedling 129. X.
437. Le Mahdi. VIII.
438. Frau Antonin Buchner. I.
439. Goliath. VI.
440. †Tapis Blanc.
441. ||Asia.
442. Loki. III.
443. Fiancée. I.
444. F. W. Maure. III.
445. Météore. II.
446. Gruppenkönigin. II.
447. Seedling 120. II.
448. Dr. Königshofer. IV.
449. Selma. II.
450. Antonin Mercié. IX.
451. L'Aiglon. VI.
452. The Dove. I.
453. Iris. VIII.
454. Gloire de Maroc. VIII.
455. Freifräulein von Lassberg. I.
456. Frau Richard Gross. I.

NOTE.

Type *a* = a self-coloured flower.
,, *b* = an "eyed" flower. The eye is red, but in flowers of a blue shade it becomes magenta or rose.
,, *c* = a "centred" flower. The "centre" is usually red.

A.M. = Award of Merit.
XXX = Highly Commended.
XX = Commended.

SECTION I.—*Flowers* WHITE.

108. Aglaë Adanson.—Type *b*. Eye very pale; a very poor doer; 3 feet; early.

196. Anna Regina.—Type *a*. 3½ feet.

35. Avalanche, **A.M.** July 24, 1894.—Type *a*. 3½ feet.

42. Belle Alliance —Type *c*. Centre flushed carmine; 3 feet.

296. Émile Duclaux.—Type *b*. 2 feet.

3, 163, 265, 390. Europe, **A.M.** August 17, 1915.—Truss broad, large; flowers large, substance good.

443. Fiancée, **A.M.** July 25, 1899.—Type *a*. A poor doer; 2 feet.

† This stock failed. || Not true to name.

85, 251, 279. Flora Hornung, **XX** August 17, 1915.—Centre carmine, spreading; 2½ feet; early.

57, 97, 111, 191, 228, 256, 269, 438. Frau Antonin Buchner, **A.M.** August 2, 1910.—Type *a*. Flowers large; substance very good; tube flushed with rose; truss large, pyramidal; 3½ feet; early.

456. Frau Richard Gross.—Type *c*. Large, coloured centre; 3½ feet.

220. Frau Rich. Volpelius.—Type *b*. Flower slightly flushed; a poor doer; 3 feet.

106, 188, 455. Freifräulein von Lassberg, **A.M.** Sept. 1, 1908.—Type *a*. Tube greenish; 2½ feet.

224, 273. Harry Pfleiderer.—Type *b*. Flushed; 3½ feet.

277. Hélène Vacaresco.—Type *a*. 3 feet.

128. Henri Murger, **XXX** July 22, 1892.—Type *a*. Less refined, otherwise like 'Europe.'

192, 401. Joséphine Gerbaux, **XX** August 17, 1915.—Type *b*. Trusses large, compact, pyramidal, standing clear of the foliage; 4 feet.

98. Lady Grizel, **A.M.** August 17, 1915.—Type *a*. Tube and back of segments blue; 3½ feet.

213, 321. La Neige, **A.M.** August 17, 1915.—Type *a*. Truss small, compact; flowers medium; 3 feet.

315. La Perle.—Type *a*. Flushed faintly with pink; 3 feet.

208. Magician.—Type *b*. Eye pale; 3½ feet.

371. Miss Bouverie.—This stock was 'Mrs. E. H. Jenkins.'

411. Marchioness of Tweeddale.—Type *a*. 3 feet.

197. Mrs. E. H. Jenkins, **XXX** August 17, 1915.—Type *a*. Trusses immense, pyramidal; flowers rather small; 4 feet.

416. Oculata, **XX** August 17, 1915.—Type *b*. Eye pale; trusses short and broad; flowers medium, of good shape and substance; 3½ feet.

358. Paniculata alba.—Type *a*. Flowers very showy; 6½ feet.

349. Poussin.—Type *b*. 2½ feet.

28. Salome.—Type *c*. Centre carmine; 4 feet.

418. Seedling 125.—Type *a*. 4½ feet.

435. Seedling 128.—Type *a*. 2½ feet.

436. Seedling 129.—Flushed blue; 4 feet.

427. Seedling 135.—Type *a*. 3 feet.

119. Snowdon.—Type *a*. Suffruticosa class; 2 feet.

20. Snowflake.—See 'Tapis Blanc.'

415. Striatum.—Type *a*. Flowers good; 4½ feet.

129, 134, 189, 345.—Tapis Blanc, **A.M.** August 28, 1906.—Type *a*. Trusses dense; flowers medium size; substance good; eye bright; 3½ feet.

49, 452. The Dove.—Type *b*. Eye pale; 4 feet; late.

413. The Queen.—Type *b*. Eye pale; 3 feet.

227. White Éclaireur.—Type *a*. Flower tinged mauve; 3½ feet.

339. W. J. Marlow.—Type *a*. 3 feet.

SECTION II.—*Flowers* PINK.

234. Albert Leteau.—Type *b*. 3 feet.

44. Annie Laurie.—Type *c*. Flowers dull; very poor; 2½ feet.

71, 178, 320, 382. Arthur Ranc, **XXX** August 17, 1915.—Type *c*. Centre diffuse; very free; trusses large, compact, pyramidal; flowers large; substance good; stem red; 4 feet.

33, 148, 204, 406. Béranger, **A.M.** July 27, 1897.—Type *c*. 2½ feet.

47. Bourgmestre Ritter.—Type *b*. 6 feet; late.

50, 313. Cameron.—Type *c*. Centre small; 3 feet; early.

309. Comtesse de Jarnac, **XXX** Sept. 4, 1908.—Type *b*. Foliage variegated; 3½ feet.

303. Delicies.—Type *c*. 3 feet.

5, 65, 124, 198, 254, 300, 432. Elizabeth Campbell, **A.M.** August 30, 1910.—Type *c*. Trusses good, pyramidal, fine colour; very early; 3 feet.

6. Fr. Grimm, **XXX** August 17, 1915.—Type *b*. Very free; trusses pyramidal; flowers a little starry; substance fair; foliage very dark; 4 feet.

207. Frau Dr. Ackernecht.—Type *b*. 3½ feet; early.

181. Frühlicht.—Type *c*. 3 feet; early.

287. G. Rodenbach.—Type *b*. 3¼ ft.

101, 248, 262, 271, 446. Gruppenkönigin, **A.M.** August 13, 1907.—Type *b*. 3 feet; late.

215. Hodur.—Type *c*. 3½ feet; early.

12. Hortense.—Type *c*. 3 feet.

61. Ironie.—Intermediate between types *b* and *c*. 2½ feet.

275. John Forbes, **XX** August 2, 1892.—Type *b*. Truss large, loose; flowers medium.

276. John Lamont.—Type *a*. 2 feet.

226, 430. Kücken.—Type *b*. Eye light; poor doer; 2¾ feet.

116. Lady Hermione.—Type *c*. 4½ feet; early.

316. Lady Menzies.—Type *b*. 4 feet.

139. Lady Molly.—Type *b*. Flowers dull; 3 feet.

373. Marchioness of Linlithgow.—Type *b*. 3 feet.

153. Maspéro.—Type *c*. Flowers deep rosy pink; 3½ feet.

154, 200, 445. Météore, **A.M.** August 17, 1915.—Truss very large, loose; flowers light, good substance; stem dark; 4 feet.

9. Minerva.—Type *b*. 2½ feet.

86, 107, 355. Mrs. Oliver.—Type *c*. 3 feet; late.

419. Mrs. R. C. Pulling.—Type *b*. 4¼ feet.

356. Muriel Rogers, **XXX** July 29, 1909.—Type *b*. 3½ feet.

241. Ostara.—Type *b*. 3 feet.

93, 115, 168. Panthéon, **XX** August 17, 1915.—Type *c*. Truss large, broad; flowers large, substance good; stem stout; 4 feet.

383. Paul Ehmann.—Type *b*. 3½ feet.

120. Paul Martin.—Type *c*. 3½ feet.

267. Rosamundi.—Type *a*. 4 feet.

40, 123, 216, 266, 449. Selma, **A.M.** August 17, 1915.—Type *b*. Truss very large, pyramidal; flowers large, substance very good; 4½ feet.

87, 229. Sheriff Ivory, **XXX** August 17, 1915.—Type *b*. Truss medium size, pyramidal; flowers fairly large, of good substance; 3½ feet.

447. Seedling 120.—Type *b*. 3½ feet.

SECTION III.—*Flowers* SALMON.

322. Adonis.—Type *b*. Flowers touched, scarlet; 3 feet; early.

68. Aubrey Alder, **A.M.** August 17, 1915.—Type *b*. Truss large, rounded; flowers deep, fairly large, segments a little pinched; 3½ feet.

199, 307, 425. Aurora, **XXX** August 17, 1915.—Type *b*. Truss very large; flowers large, deep scarlet-salmon; substance good; 3½ feet.

323. Border Beacon.—Type *c*. 3½ feet.

396. Boule de Feu, **XXX** August 16, 1892.—Type *b*. 4½ feet.

206. Colonel Mangin.—3½ feet.

301. De Mirbel.—Type *b*. 3 feet.

218. Donar.—Type *b*. 3½ feet.

298. Duke of Marlborough.—Type *b*. Flowers scarlet-salmon; 3 feet.

238. Étienne Lamy.—Type *c*. 2½ feet.

24, 112, 177. Fort de France, **XXX** August 17, 1915.—Type *b*. Truss roundish; flowers medium size, deep; very good substance; stem dark; 3½ feet.

14. Frau Eliz. Krehl.—Type *c*. 3 feet.

444. F. W. Maure.—Type *b*. Flowers light; 3 feet.

58. J. E. Suckling, **XXX** August 17, 1915.—Type *b*. Truss large; flowers very large; good substance; 3½ feet.

328. Lady Miller.—Type *b*. 2½ feet.

325. Lady Minto.—Type *b*. 3 feet.

155, 374. Liberté.—Type *b*. 5 feet.

34, 214, 442. Loki.—Type *b*. 3½ feet.

317. Marchioness of Tullibardine.—Type *c*. Flowers light; 2½ feet; early.

362. Mrs. Derring.—Type *b*. Flowers deep; 4 feet.

230. Mrs. John Harkness.—Type *b*. 4 feet.

351. Roger Marx.—Type *b*. Flowers deep; 2½ feet; early.

353. Seduction, **XXX** August 17, 1915.—Type *a*. Truss large, pyramidal; flowers deep; substance good; 3½ feet.

18. Squire Aldersey.—Type *b*. Flowers light; early.

244. Toreador.—Type *b*. 3 feet.

94. William Robinson, **XXX** August 16, 1892.—Type *b*. Truss very large, loose, pyramidal, borne on stout stem; flowers large; 4½ feet.

SECTION IV.—*Flowers* ORANGE-SCARLET.

29, 194, 257, 311, 394. Baron von Dedem, **XXX** August 17, 1915.—Type *a*. Truss large, loose; flowers medium size; very free; 4 feet.

88. Charles Dickens.—Type *b*. 3 feet.

27, 117, 187, 305. Coquelicot, **A.M.** July 27, 1897.—Type *b*. Truss long, pyramidal; flowers medium size; substance good; colour brilliant; 4½ feet; early.

242, 263, 448. Dr. Königshofer, **XXX** August 17, 1915.—Type *b*. Truss small, compact; flowers medium size, very bright; substance very good; 3½ feet.

41, 182, 293, 386. Embrasement.—Type *b*. Flowers light; 2½ feet.

122, 294, 385. Etna, **A.M.** August 8, 1893.—Type *a*. 3½ feet.

428. F. J. Wells.—Type *b*. 4½ feet.

4. Geheimrat Dr. Königshofer.—See 'Dr. Königshofer.'

31, 109, 211, 261, 278, 398. General van Heutsz, **XXX** August 17, 1915.—Type *c*. Centre becomes purple with age; truss loose, fairly large; form good; 4 feet.

113, 250, 284, 381. Georg A. Ströhlein, **A.M.** October 1, 1907.—Type *b*. Truss large, pyramidal; substance of flowers good; stem reddish; 4 feet.

282. Hermann Ostertag.—Type *b*. 4½ feet.

151. Jocelyn.—Type *b*. Flowers bright; 2½ feet; late.

30, 142. Lady Satanella, **XXX** August 17, 1915.—Type *b*. Truss large, loose; flowers medium size; colour bright; substance good; 4 feet.

361. Mont Pelée.—Type *a*. 2½ feet.

44, 365, 421. Mounet Sully, **XXX** August 12, 1909.—Type *b*. 3½ feet.

174. Robert Blos.—Type *b*. 3½ feet.

346. Sir William Carrington.—Type *b*. 4½ feet.

331. William Scott, **XX** August 17, 1915.—Type *b*. Flowers immense; colour remarkably good.

SECTION V.—*Flowers* RUBY-RED.

392. Aegir, **XXX** August 17, 1915.—Type *a*. Truss very large, flowers medium size; substance fair; 3½ feet; late.

36. Aquilon.—Type *a*. Flowers very light; 4½ feet; late.

312. Coccinea, **F.C.C.** 1876.—Type *a*. 2½ feet.

84. King Edward.—Intermediate between types *b* and *c*. Poor doer; 2½ feet.

60, 102. Tragédie.—Type *b*. 3½ feet.

SECTION VI.—*Flowers* ROSE.

223. Admiral Campion.—Type *b*. Flowers flushed; 3½ feet.

327. Albert Harwood.—Type *c*. 2½ feet; early.

79. Alliance Russe.—Type *c*. Flowers light; centre small; 4 feet.

2, 23, 203. Asia.—Type *b*. Flowers dull light rose, centre bright; 3½ feet.

184, 403. Bacille.—Type *a*. Flowers purplish; 2½ feet; early.

22, 422. Belvédère, **XX** August 16, 1892.—Type *a*. Flowers light; 3½ feet; early.

91, 221. Caran d'Ache.—Type *a*. 2½ feet; early.

105. Champignol, **XX** August 17, 1915.—Type *b*. Truss large, loose, graceful; flowers medium size, good substance; 4½ feet; early.

212, 395. Clara Benz.—Type *a*. 2 feet; early.

45, 235. Comet.—Type *c*. Colour hard; 2½ feet.

138. De Bois.—Type *c*. 3 feet.

11. Elektra.—Type *a*. Flowers deep; 4½ feet.

32. Émile Michel.—Type *b*. Flowers deep; 3¼ feet.

288. Felicity Rogers.—Type *c*. Poor doer; 3 feet.

286. F. J. Marshall.—Type *c*. 2 feet.

283. Florrie Cooper.—Type *a*. 1½ feet.

414. Frank Bouskill.—Type *b*. 3½ feet.

166, 412. Gartendirektor Broderson.—Intermediate between types *a* and *c*; 3 feet.

54, 170. Gloire de Maroc.—Type *b*. 3½ feet.

96, 201, 264, 439. Goliath, **XXX** August 17, 1915.—Type *b*. Truss immense, pyramidal; flowers large, substance good; 5 feet; early.

15. Helmuth Hirth, **XXX** August 17, 1915.—Type *b*. Truss dense; flowers medium size, substance good; eye bright; 3½ feet.

319. John McLeod.—Type *b*. 2 feet; early.

240, 255. Jules Sandeau, **XXX** August 17, 1915.—Type *c*. Centre small; truss medium size, compact; flowers large; 3 feet.

126. Jungfrau.—Type *b*. 4½ feet.

161, 451. L'Aiglon, **XX** August 17, 1915.—Type *c*. Centre cloudy; truss medium size; substance fair; 3½ feet.

280. Lady Glenconner.—Type *b*. 2½ feet; early.

217. Louis Botha.—Type *c*. Centre small; 2 feet.

78. Lumineux.—Type *c*. Centre light; 3 feet; early.

76. Marquis de St. Paul.—Type *c*. 3 feet.

370. Mentmore.—Type *b*. 3 feet.

399. M. Graham.—Type *a*. 3 feet.

369. Mhairi.—Type *b*. 3½ feet.

364. Miss Willmott.—Type *a*. Flowers light; 4 feet.

63, 384. Mrs. A. Baker.—Type *a*. 3½ feet; early.

363. Mrs. Aberdeen.—Type *b*. Flowers deep; 3½ feet.

429. Mrs. G. F. Richardson.—Type *b*. 4 feet.

100. Mrs. Miller.—Type *b*. Suffruticosa. Flowers pale; 2½ feet; early.

232. Neptune.—Type *a*. 3½ feet.

93, 115, 168. Panthéon, **XXX** August 16, 1892.—Type *a*. 3 feet.

359. Obergärtner Mack.—Type *a*. 3 feet.

185. Perle Rose.—Type *b*. 4 feet.

354. Printemps.—Type *c*. 3½ feet.

352. Progress.—Type *c*. Centre light ; 3 feet.

210. René Bazin.—Type *c*. 2½ feet.

90, 136, 180, 258, 268, 420. Rijnstroom, **A.M.** September 10, 1912.—Type *c*. Truss good, pyramidal ; flowers medium size ; spots with rain ; 3½ feet.

62. Rosa Beera.—Type *a*. 2½ feet.

51, 393. Rose Queen, **XXX** August 17, 1915.—Type *b*. Truss large, short, pyramidal ; flowers large ; substance good ; 4¼ feet.

21. Santos Dumont.—Type *b*. 3½ feet ; early.

417. Seedling 116.—Type *c*. Centre streaky ; 2½ feet.

424. „ 123.—Type *b*. Bud colour, rose-purple ; 3½ feet.

426. „ 136.—Type *b*. Flowers dull, poor ; 3½ feet.

147, 344. Sergent Lovy, **XXX** August 17, 1915.—Type *c*. Centre light ; truss large ; flowers large ; substance good ; 3 feet.

348. Sheila.—Type *b*. Very poor.

176. Souvenir de Mme. Paul Leturque.—Type *b*. Flowers light ; poor doer ; 3½ feet.

340. Theresa.—Type *a*. 2½ feet.

205. Torpilleur, **A.M.** July 27, 1897.—Intermediate between types *a* and *b* ; 2 feet.

19. Uncle Tom.—Type *a*. Flowers very deep ; 4 feet.

17. Viktor Stössel, **XXX** August 17, 1915.—Type *b*. Truss good ; eye very brilliant ; 3½ feet ; late.

164, 408. Wolfgang von Goethe.—Intermediate between types *a* and *c*. Poor doer ; 3 feet.

SECTION VII.—*Flowers* PURPLE.

83. Admiral Cambon.—Type *c*. Centre diffuse ; 4½ feet.

335. Ary Scheffer.—Type *b*. 2½ feet.

336. Auguste Raffet.—Type *c*. 2½ feet.

8. Australia.—Type *a*. Flowers reddish ; 4 feet.

69. Champs Élysées.—Type *b*. Free ; flowers medium size ; lasts well ; 3½ feet.

127. Cœur de Lion.—Type *b*. Eye diffuse ; 3 feet.

302. Contradiction.—Type *a*. 3 feet.

297. De Lacépède.—Type *a*. Flowers pale ; 3½ feet.

304. Dr. Schleicher.—Type *a*. 3½ feet.

80, 146, 236, 388. Éclaireur, **A.M.** August 23, 1892.—Type *c*. 3½ feet. No. 80 was an "eyed" type and redder in colour.

290. Eminence.—Type *b*. 4 feet.

202. Emanuel de Rouge.—Type *a*. Flowers reddish ; 4 feet.

292. Erich Ruger.—Type *c*. Flowers reddish ; 2½ feet.

175. François de Neufchâtel.—Type *b*. Flowers light ; 4 feet.

252. Gretchen Goos.—Type *c*. Flowers purple, large white centre; 2 feet.

77. Guillaume Dulinge.—Type *c*. Flowers light; 3½ feet.

270. James Hamilton.—Type *b*. 4½ feet.

274. J. C. Meek.—Type *c*. Centre nearly white; 3½ feet.

334. Joseph Chamberlain.—Type *b*. 3 feet.

103. Lady Diana.—Intermediate between types *a* and *b*.

380. Le Vengeur, **XXX** August 14, 1908.—Type *b*. 4 ft.

377. Mark Twain.—Type *a*. Flowers light; 3 feet.

366. Mrs. Graham Wigan.—Type *b*. Flowers dull; 4 feet.

330. Mrs. Grenander.—Type *b*. Dull white ring round eye; 4 feet.

156. Multiflore.—Type *c*. Poor doer; 2½ feet.

158, 243, 260, 341. Reichsgraf von Hochberg, **XX** August 17, 1915.—Type *a*. Truss large, flattish; flowers medium size; colour very deep; 4 feet.

179. Rosenberg.—Type *a*. Poor doer; 3½ feet; late.

409. Royal Purple.—Type *a*. 3 feet.

209, 347. Savorgnan de Brazza.—Type *c*. 3 feet.

246. Walter Wright.—Type *a*. 3½ feet.

SECTION VIII.—*Flowers* VIOLET.

239. Albert Vandel.—Type *b*. 3 feet.

310. C. A. Hope.—Type *a*. 4 feet; early.

308. C. de Boufflers.—Type *a*. 3½ feet.

46. Dennis Peuch.—Type *c*. Flowers light; 3 feet.

81, 160. Derviche, **XXX** August 17, 1915.—Type *c*. Truss large, loose; flowers medium size, substance fair; 5 feet.

140, 245, 402. Dr. Charcot.—Type *c*. Flowers pale; 3½ feet; early.

167. Emmanuel Arends.—Type *c*. 2 feet.

454. Gloire de Maroc.—Type *b*. 2½ feet.

59, 253, 272, 453. Iris, **A.M.** August 14, 1894.—Type *a*. 4 feet.

144. Lady Dolly.—Type *a*. 3 feet.

114. Lady Grey.—Type *b*. Poor doer; 3½ feet.

73, 136, 172, 437. Le Mahdi, **A.M.** August 15, 1899.—Type *b*. Truss good, pyramidal; flowers medium size; spots with rain; 3½ feet.

367. Marvel, **XX** August 17, 1915.—Type *b*. 3 feet; late.

372. Miss Pemberton, **A.M.** September 21, 1897.—Type *b*. Truss short, compact; flowers large; stem dull red; 3 feet.

169, 410. ***nana coerulea***.—Type *c*. 2½ feet.

156, 360. Paul Bert, **XXX** August 16, 1892.—Type *c*. Centre flushed, 4 feet.

38. Richard Strauss.—Type *c*.

222, 387, 433. Widar, **XXX** August 17, 1915.—Type *c*. Truss large, broad; flowers large, substance good; 3½ feet.

SECTION IX.—*Flowers* MAUVE.

70, 95, 183, 450. Antonin Mercié, **A.M.** August 17, 1915.—Type *c*. Very free; truss large, pyramidal; flowers large, substance good; 4 feet.

39, 247. Artaxis.—Type *c*. 4 feet.

72, 143. Atala.—Type *c*. Centre mallow pink; 3½ feet.

404. Beauty of Warwick.—Type *c*. 3 feet.

173, 389. Braga, **XXX** August 17, 1915.—Type *c*. A pink shade of 'Antonin Mercié.'

82, 133, 219. Crépuscule.—Type *b*. Flowers flushed violet; 2½ feet.

157. De la Croix.—Type *c*. 2 feet.

37, 431. Distinction, **XXX** August 17, 1915.—Type *a*. Truss medium size, compact; flowers medium size, substance good; 4 feet.

299. E. Boissier.—Type *c*. 2½ feet.

55, 150. Esclairmonde.—Type *c*. Centre indistinct; 4 feet.

74. Espérance, **A.M.** August 17, 1915.—Type *c*. Truss very good, pyramidal; flowers large, round; eye pinkish; 3½ feet.

89, 104, 291. Eugène Danzanvilliers, **A.M.** August 10, 1897.—Type *c*. 3½ feet.

75, 195. Eugen Feyen.—Type *c*. Flowers pinkish; substance poor; 3 feet.

99. Francillon.—Type *b*. Flowers reddish; 3 feet.

13. Garteninspektor Krauss.—Type *c*. 2½ feet; early.

26, 281. Geoffroy St. Hilaire.—Type *b*. Eye rosy; 3½ feet.

16. Hans Vollmoller.—Type *c*. Very late.

141, 249, 391. Jules Cambon, **XXX** August 14, 1908.—Type *c*. Centre reddish; truss very large, pyramidal; flowers of good substance; 4 feet.

314. Lady Tate, **XXX** August 17, 1915.—Type *c*. Centre pinkish, very beautiful; 3½ feet.

318. Lady Northcote.—Type *c*. Centre pale, pinkish; 3½ feet.

326. Lady Rayleigh.—Type *c*. Mixed stock; 2½ feet.

333. La Fraîcheur.—Type *c*. Centre small; 2½ feet.

231. Le Prophète.—Type *c*. 2½ feet.

259. Lofna.—Type *c*. 3 feet.

423. Miss Emma Roope.—Type *c*. Centre deep; 3½ feet.

368. Mistral.—Type *c*. 3 feet.

405. Mrs. R. Goodwin Golby.—Type *b*. 2½ feet.

357. *paniculata*.—Type *a*. A showy plant; 6½ feet.

56, 350. Paul Fliche.—Type *c*. Centre reddish rose; 3 feet.

145, 237. Pharaon, **XXX** August 17, 1915.—Type *c*. Truss medium size; flowers large, light; substance good; 3 feet.

343. Sarabande.—Type *c*. Centre rosy; 3 feet.

434. Sinbad.—Type *a*. Flowers bluish; 2 feet.

337. Sosie.—Type *c*. Flowers pinkish; 2 feet.

92, 110, 165, 338, 397. Violetta.—Type *c*. 2½ feet.

SECTION X.—*Flowers* FLUSHED.

324. A. J. Ashmore.—Flowers pale pinkish mauve blush; 3 feet.

53. Amphitryon.—Flowers blue; 4 feet.

118. Cendrillon.—Flowers blue; 3½ feet.

48, 190, 295. Daniel Lesueur, **XX** August 17, 1915.—Truss large, loose; flower large, blue; tube reddish; substance fair; 4 feet.

171. Duguesclin.—Flowers blue; 4 feet.

285. Favourite.—Flowers blue; 2½ feet.

64. Fedora.—Flowers pink; 3 feet.

152. Freia.—Flowers white, flushed pink; 2½ feet.

186. Gustave Nadaud.—Flowers mauve; 2½ feet.

10. Hayo Eilers.—Flowers blue; 2½ feet; early.

121. Javanaise.—Flowers blue; 3½ feet.

66. Lady Beaconsfield.—Flowers pink; 3½ feet.

329. Lady Tweeddale, **XXX** August 14, 1908.—Flowers white, flushed pinkish mauve; 3 feet.

379. Lizette.—Flowers white, flushed blue; 2 feet.

193. Lope Cortes.—Flowers pale blue; 3½ feet.

376. Mme. M. Carvalho, **XXX** July 29, 1908.—Flowers mottled white and pink; 3½ feet.

52, 149, 233, 375, 400. Mme. Paul Dutrie.—Flowers apple-blossom coloured flush; 4 feet.

378. Marjolaine.—Flowers rose; 2½ feet.

407. Mrs. W. Wraite.—Flowers rose pink; 3½ feet.

225. Rheingau.—Flowers pink; 2½ feet.

137. Spirite.—Flowers pink; 3 feet.

PYRETHRUMS AT WISLEY, 1915.

REPORT BY C. C. TITCHMARSH, Trials Officer.

ONLY three growers responded to the invitation to send Pyrethrums for trial.

The majority of the stocks arrived at Wisley during February and March 1913, and were planted in the Trial Beds near the Herbaceous Border. Notwithstanding every attention to cultural details, the plants made but little progress and were not in a proper condition to be judged in 1914.

Together with a few fresh arrivals, the plants were moved to the strongest soil in the gardens—the beds near the Rose Arch—where they improved considerably, although the display at flowering time was somewhat disappointing. It may be concluded that the Pyrethrum is not a plant suitable for growing on a light, warm soil, such as that of Wisley. It is not to be inferred that the results of the trial as reported are of little value, but rather the contrary, that those which have best withstood this rigorous test are the best in their several sections. The cultivation of the plants was under the care of Mr. J. Blakey, Assistant Superintendent.

The garden Pyrethrum is derived from *Chrysanthemum coccineum, Beib. taur. cunc.* 2, 324 (*Pyrethrum roseum*), figured in *Bot. Reg.* t. 1024.

The Sub-Committee selected the following varieties as the best in the trial :—

GROUP I.—FLOWERS SINGLE.

a. Flowers WHITE.

Queen of the Whites. Snow White.

c. Flowers PINK.

Roseum. Record.

d. Flowers DEEP PINK.

Punch.

f. Flowers DEEP ROSE.

Eglantine. Firefly.

g. Flowers CRIMSON.

General Gaselee. Langport Scarlet.

GROUP II.—FLOWERS DOUBLE.

a. Flowers WHITE.

Aphrodite. Samranburgh.

c. Flowers BLUSH.

Souce. Queen Mary.

d. Flowers PINK.

Boccace. Fulgens plenissimum.
Le Dante.

e. Flowers LIGHT ROSE.

Gem.

f. Flowers DEEP ROSE.

Andromeda. Ernest Kelway.
J. M. Twerdy.

LIST OF VARIETIES.*

1. Minnie Fowler. II*d*.
2. Lord Rosebery. II*d*.
3. Leonard Kelway. II*c*.
4. Ovid. II*e*.
5. Lady R. Churchill. II*a*.
6. King Oscar. II*f*.
7. Yvonne Cayeux. II*b*.
8. Wilson Barrett. II*d*.
9. Toison d'Or. II*b*.
10. Souce. II*c*.
11. Sir J. Miller. II*f*.
12. Queen Alexandra. I*e*.
13. Langport Scarlet. I*g*.
14. Murillo. II*f*.
15. Lady Derby. II*c*.
16. J. M. Twerdy. II*f*.
17. †Queen Sophia.
18. †Lord Milner.
19. Snow White. I*a*.
20. Electric. I*d*.
21. Beauty. I*e*.
22. Queen of the Whites. I*a*.
23. Vésuve. I*f*.
24. Firefly. I*f*.
25. Mrs. Wm. Kelway. I*b*.
26. Dorothy. I*b*.
27. King of Spain. I*e*.
28. Lady of Langport. I*d*.
29. Ornament. I*c*.
30. General Gaselee. I*g*.
31. Robert Wainwright. I*e*.
32. Princess Marie. I*a*.
33. Pitho. I*e*.
34. Punch. I*d*.
35. Pretoria. I*e*.
36. Record. I*c*.
37. Queen of the Whites. I*a*.
38. Roseum. I*c*.
39. Referee. I*f*.
40. R. Carruthers. I*e*.
41. Roxburgh. I*b*.
42. Sir Hugo. I*f*.
43. Saturn. I*d*.
44. Spider. I*b*.
45. Sir E. Seymour. I*e*.
46. Tasso. I*f*.
47. Sylvia. I*f*.
48. Volunteer. I*e*.
49. Wm. Oliver. I*f*.
50. Telegraph. I*e*.
51. Tatler. I*e*.
52. Mrs. Cairns. I*g*.
53. Mrs. Bruce Findlay. I*d*.
54. Elsie Gertrude. I*a*.
55. Alfred Kelway. II*f*.
56. Queen Mary. II*c*.
57. Alfred Henderson. II*f*.
58. Ernest Kelway. II*f*.
59. Amelia. I*b*.
60. A. M. Kelway. I*e*.
61. †Bayard.
62. Apollo. I*e*.
63. Choix. I*e*.
64. Countess of Onslow. I*b*.
65. Comet. I*a*.
66. Clemence. I*f*.
67. Conspicua. I*e*.
68. Conquest. I*a*.
69. Dalziel. I*e*.
70. Cupid. I*e*.
71. Eglantine. I*f*.
72. †Dumas.
73. ‡Evelyn.
74. †Eva.
75. Evelthon. I*d*.
76. Express. I*c*.
77. Figaro. I*b*.
78. †Fairy.
79. Fun. I*a*.
80. Florus. I*b*.
81. General Gaselee. I*g*
82. †Gem.
83. Grace. I*a*.
84. †Goring Thomas.
85. Hamlet. I*c*.
86. Gyp. I*c*.
87. Jessie. I*d*.
88. Iona. I*d*.
89. Kleinholtz. I*e*.
90. Kimberley. I*e*.
91. Leda. I*a*.
92. Leader. I*a*.
93. Mercury. I*e*.
94. Lycorus. I*e*.

* See footnote, p. 117. † Stock failed ‡ Stock mixed.

95. Mrs. Bateman Brown. I*f*.
96. Mirror. I*c*.
97. Nelly. I*e*.
98. Mrs. Chamberlain. I*d*.
99. Neptune. I*d*.
100. Nemesis. I*d*.
101. Ninus. I*d*.
102. Ormunda. I*d*.
103. Parthenon. I*d*.
104. Amethyst. II*e*.
105. Achilles. II*d*.
106. Aphrodite. II*a*.
107. Andromeda. II*f*.
108. Alfred. II*f*.
109. Anemonaeflorum sanguineum. II*e*.
110. Boccace. II*d*.
111. Beauté de Laeken. I*f*.
112. Chamois. II*d*.
113. Bon Ami. II*b*.
114. Captain Nares. II*e*.
115. Candidum plenum. I*b*.
116. Dulcima. II*a*.
117. Diomedes. II*c*.
118. Ernest Kelway. II*f*.
119. Duchess of Edinburgh. II*d*.
120. Figaro. II*f*.
121. Evelyn. II*e*.
122. Gem. II*e*.
123. Fulgens plenissimum. II*d*.
124. Gloire de Stella. II*e*.
125. Globe. II*e*.
126. Haage und Schmidt. II*e*.
127. Godiva. II*c*.
128. Henri Murger. II*e*.
129. Hermann Steiger. II*g*.
130. Imbricatum plenum. II*e*.
131. Homerus. II*e*.
132. Lady Kildare. II*c*.
133. King Oscar. II*f*.
134. Louis Delasalle. II*e*.
135. Leonard Kelway. II*f*.
136. Lord Rosebery. II*f*.
137. Lycius. II*d*.
138. Mme. Patti. II*e*.
139. Magician. II*d*.
140. Mont Blanc. II*a*.
141.†Madame Biel.
142. Marquis of Salisbury. II*e*.
143. Monsieur Barral. II*e*.
144. Modesty. II*c*.
145. Murillo. I*f*.
146. Niobe. II*c*.
147. Nero. II*e*.
148. Princess of Teck. II*e*.
149. Psyche. II*d*.
150. Pizarro. II*a*.
151. Princess de Metternich. II*a*.
152. Reine Blanche. I*a*.
153. Queen Alexandra. II*a*.
154. Samranburgh. II*a*.
155. Rendigo. I*a*.
156. Sylphide. II*a*.
157. Striatum plenum. II*d*.
158. Souce. I*d*.
159.‡Shotover.
160. Uzziel. II*c*.
161. Toison d'Or. II*b*.
162. Voie Lactée. II*c*.
163. Virginale. II*a*.
164. White Aster. II*a*.
165. Virgo. II*b*.
166. Wilson Barrett. II*d*.
167. Yvonne Cayeux. II*b*.
168. Albion. I*a*.
169. Albert Victor. I*e*.
170. Alroy. I*f*.
171. Goring Thomas. I*c*.
172. Lady Alfred Harmsworth. I*d*.
173. Langport Knight. I*e*.
174. James Kelway. I*g*.
175. Stewart Clark. I*d*.
176. Punch. I*d*.
177. Roseen. I*c*.
178. The Shah. I*f*.
179. Beatrice Kelway. I*e*.
180. Fun. I*a*.
181.†Pinkie.
182. Wega. II*c*.
183. Le Dante. II*d*.
184.†Chamois.
185. Richesse. II*c*.

Nos. 1–31, 55–58, 171–185, from Messrs. Kelway; 32–51, 59–170, from Messrs. Forbes and 52, 53, 54 from Messrs. Harkness.

GROUP I.—FLOWERS SINGLE.

SECTION *a*.—*Flowers* WHITE.

168. Albion.—Flowers 2¾ inches in diameter; ray florets broad, slightly curled; disc semi-double; 27 inches high.

65. Comet.—Flowers very small, out of character.

68. Conquest.—Flowers 3½ inches in diameter; disc small; a continuous flowering variety; 36 inches high.

54. Elsie Gertrude.—Flowers 3 inches in diameter; ray florets broad; disc coarse; 36 inches high.

† Stock failed. ‡ Stock mixed.

79, 180. Fun.—Flowers freely produced, 3 inches in diameter; ray florets in several whorls, short, broad; disc coarse; 32 inches high.

83. Grace.—Flowers freely produced; 2½ inches in diameter; ray florets starry; flower-stalk bare; not a good lasting variety; 33 inches high.

92. Leader.—Flowers 3 inches in diameter, rather coarse, but stand well and produced over a long period; ray florets short and broad, large; 29 inches high.

91. Leda.—Flowers 2¾ inches in diameter; ray florets slightly twisted and incurved; disc small; flower-stalk bare; 35 inches high.

32. Princess Marie, **A.M.** June 7, 1892.—Flowers 3 inches in diameter; ray florets of rather poor substance; disc coarse; 28 inches high.

22, 37. Queen of the Whites, **XX** June 11, 1915.—Flowers anemone-centred, 3¾ inches in diameter; ray florets slightly drooping; 24 inches high.

152. Reine Blanche.—Flowers 2¾ inches in diameter; ray florets reflexing; disc somewhat anemone; 24 inches high.

155. Rendigo.—Flowers 3 inches in diameter, anemone centred; ray florets quilled and twisted; 26 inches high.

19. Snow White, **A.M.** June 7, 1910.—Flowers 3 inches in diameter; ray florets drooping; disc refined, creamy; plant strong, free-flowering; 35 inches high.

SECTION *b.—Flowers* BLUSH.

59. Amelia.—Flower 3½ inches in diameter; ray florets broad, colour streaky; plant strong, free-flowering; 34 inches high.

115. Candidum plenum.—Flowers 3 inches in diameter, anemone centred; ray florets twisted, incurved; plant weak; 30 inches high.

64. Countess of Onslow.—Flowers 2½ inches in diameter; ray florets short; florets in outer whorls of disc somewhat developed; 29 inches high.

26. Dorothy.—Flowers 3 inches in diameter; ray florets very softly coloured, with a white ring around the disc; flower-stalk bare; 31 inches high.

77. Figaro.—Flowers poor, out of character. Not the same variety as No. 120.

80. Florus.—Flowers 3 inches in diameter, very starry; disc small; 33 inches high.

25. Mrs. William Kelway.—Flowers 3 inches in diameter; disc coarse; flower-stalk bare; 37 inches high.

41. Roxburgh.—Flowers 2½ inches in diameter; ray florets in several whorls; florets in outer whorls of disc somewhat developed; 29 inches high.

44. Spider.—Flowers 2½ inches in diameter, unattractive; ray florets long, much curled and twisted; 22 inches high.

SECTION *c.*—*Flowers* PINK. (Rosolane purple, 69′ b–d.)

76. Express.—Flowers 3¾ inches in diameter, broad, long, with a diffuse white ring around the rather coarse disc ; flower-stalk bare ; plant strong, free-flowering, 40 inches high.

171. Goring Thomas.—Flowers 3 inches in diameter ; ray florets broad, drooping, a few around the disc short and curled ; 25 inches high.

86. Gyp.—Flowers poor, out of character.

85. Hamlet.—Flowers 3½ inches in diameter ; ray florets drooping ; disc hemispherical ; plant strong, free-flowering, 32 inches high.

96. Mirror.—Flowers 3½ inches in diameter ; ray florets broad, more or less streaked with white ; plant strong, free-flowering, 27 inches high.

29. Ornament.—Flowers 3 inches in diameter ; ray florets softly coloured ; disc small ; plant strong, free-flowering, 33 inches high.

36. Record, **XX** June 11, 1915.—Flowers stand well, 3 inches in diameter ; ray florets in several whorls ; disc small, very deep yellow ; peduncle leafy ; plant strong, free-flowering, 32 inches high.

177. Roseen.—Flowers 3¼ inches in diameter ; ray florets broad, pointed ; leaves very deep green ; 31 inches high.

38. Roseum, **XXX** June 11, 1915.—Flowers 2½ inches in diameter ; ray florets broad, incurved. A dwarf variety, early, and lasts well ; 24 inches high. This is not P. roseum of *Bot. Reg.* t. 1024.

SECTION *d.*—*Flowers* DEEP PINK. (Tyrian pink, 69 b.)

20. Electric.—Flowers 3¾ inches in diameter ; ray florets somewhat drooping ; disc coarse ; flower-stem bare ; plant strong, free-flowered, 32 inches high.

75. Evelthon.—Flowers 3¼ inches in diameter ; ray florets starry, streaked with white ; disc small ; plant strong, free-flowered, 27 inches high.

88. Iona.—Poor, out of character.

87. Jessie.—Poor, out of character.

172. Lady Alfred Harmsworth.—Flowers 3½ inches in diameter ; ray florets of good substance, but the colour quickly fades to a poor magenta ; disc coarse ; 23 inches high.

28. Lady of Langport.—Flowers 2 inches in diameter ; ray florets slightly incurved, streaked with white ; lasts well ; flower-stalk leafy ; plant strong and free-flowering, 36 inches high.

53. Mrs. Bruce Findlay.—Flowers 4 inches in diameter, starry ; ray florets long, slightly twisted ; 31 inches high.

98. Mrs. Chamberlain.—Poor, out of character.

100. Nemesis.—Flowers 2¾ inches in diameter, regular in contour ; ray florets splashed white ; 27 inches high.

99. Neptune.—Flowers 2¾ inches in diameter, small, but very freely produced ; plant strong, 29 inches high.

101. Ninus.—Flowers 3 inches in diameter ; ray florets streaked with white ; disc coarse ; 26 inches high.

102. Ormunda.—Poor, out of character.

103. Parthenon.—Poor, out of character.

34, 176. Punch, **XXX** June 11, 1915.—Flowers 3 inches in diameter, elegant; ray florets standing out well; narrow white ring around disc; plant strong, free-flowering, 33 inches high.

43. Saturn.—Poor, out of character.

158. Souce.—A weak stock, not the same variety as the double variety under this name; 27 inches high.

175. Stewart Clark.—Poor, out of character.

SECTION *e.*—*Flowers* LIGHT ROSE. (Rosolane purple 69′.)

169. Albert Victor.—Flowers 2½ inches in diameter; ray florets drooping; distinct white ring around the rather coarse disc; plant weak, 33 inches high.

60. A. M. Kelway.—Flowers 3½ inches in diameter; ray florets broad, undulate; plant strong, free-flowering, 37 inches high.

62. Apollo.—Flowers 3 inches in diameter; colour poor; stem weak; 31 inches high.

179. Beatrice Kelway.—Flowers 3 inches in diameter; ray florets thin; plant weak, 28 inches high.

21. Beauty.—Flowers 3 inches in diameter; ray florets narrow, drooping, rather deeper shade; plant strong, free-flowering, 31 inches high.

63. Choix.—Flowers 3 inches in diameter; ray florets streaked white, somewhat incurved; plant strong, free-flowering, 35 inches high.

67. Conspicuum.—Flowers 3 inches in diameter; ray florets broad; disc coarse; 30 inches high.

70. Cupid.—Flowers 3 inches in diameter; the disc florets are considerably developed and approach in form those of a double flower; plant weak, 22 inches high.

69. Dalziel.—Flowers 3 inches in diameter; colour fades rather quickly; 26 inches high.

90. Kimberley.—Flowers 3 inches in diameter; ray florets recurved; disc coarse; 40 inches high.

27. King of Spain.—Flowers 4 inches in diameter; rather pale, starry; ray florets long, with a distinct white ring around the rather coarse disc; 37 inches high.

89. Kleinholtz.—Flowers 3 inches in diameter; ray florets drooping; disc coarse; 27 inches high.

173. Langport Knight.—Flowers 3½ inches in diameter; ray florets broad, paler, blotched white; disc coarse; flower-stem bare; 29 inches high.

94. Lycorus.—Flowers small, 2½ inches in diameter; rather pale, but very bright when first open; 29 inches high.

93. Mercury.—Flowers 2¾ inches in diameter, rather pale colour; but does not fade; ray florets slightly incurved; disc hemispherical; flower-stalk leafy; 31 inches high.

97. Nelly.—Flowers 2½ inches in diameter, rather pale; ray florets slightly incurved; stem slender, leafy; 35 inches high.

33. Pitho.—Flowers 2¾ inches in diameter, pale, starry; ray florets drooping; plant weak, 29 inches high.

35. Pretoria.—Flowers 4 inches in diameter, pale, fading quickly to a poor magenta; ray florets broad; flower-stalk leafy; plant strong, free-flowering, 35 inches high.

12. Queen Alexandra.—Flowers 3 inches in diameter, pale; plant strong, 31 inches high.

40. R. Carruthers.—Flowers 2¼ inches in diameter, pale, poor; disc large, hemispherical; plant strong, free-flowering, 32 inches high.

31. Robert Wainwright.—Flowers 2½ inches in diameter, pale; ray florets blotched with white; plant weak, 32 inches high.

45. Sir E. Seymour.—Flowers 3 inches in diameter; ray florets broad, short, colour streaky; peduncle leafy; plant strong, free-flowering, 42 inches high.

51. Tatler.—Flowers 2¾ inches in diameter; ray florets broad; disc coarse; plant strong, 36 inches high.

50. Telegraph.—Flowers 2½ inches in diameter; ray florets broad, with a distinct white ring round disc; peduncle bare; plant strong, free-flowering, 36 inches high.

48. Volunteer.—Flowers 3¼ inches in diameter, pale but bright; ray florets thin; disc hemispherical; plant strong, free-flowering, 33 inches high.

SECTION *f*.—*Flowers* DEEP ROSE. (Bright Amaranth purple 69 i.)

170. Alroy.—Poor, out of character.

111. Beauté de Laeken.—Flowers 3 inches in diameter; anemone centred, colour lasting; ray florets stiff, long, horizontal; peduncle leafy; 29 inches high.

66. Clemence, **A.M.** May 20, 1890.—Flowers 2 inches in diameter, fade quickly; ray florets short; 24 inches high.

71. Eglantine, **XX** June 11, 1915.—Flowers 2¾ inches in diameter, colour bright and lasting; 27 inches high.

24. Firefly, **XX** June 11, 1915.—Flowers 3¼ inches in diameter; disc coarse; plant free-flowering, very strong, 42 inches high.

95. Mrs. Bateman Brown.—Flowers 3¾ inches in diameter; ray florets long and broad, white ring round disc; plant strong, 36 inches high.

145. Murillo.—Flowers 3 inches in diameter, colour good; ray florets broad; disc coarse; 30 inches high.

39. Referee.—Flowers 3½ inches in diameter, starry; ray florets often twisted; disc small; plant free-flowering, strong, 40 inches high.

42. Sir Hugo.—Flowers 3¼ inches in diameter, colour at first good,

but quickly fades to a bad magenta; disc coarse; plant free-flowering, strong, 35 inches high.

47. Sylvia.—Flowers 2¼ inches in diameter; ray florets broad, short; disc deeply coloured; 36 inches high.

46. Tasso.—Poor, out of character.

178. The Shah.—Flowers 3 inches in diameter, colour bright, but fades badly; peduncle bare; plant free-flowering, strong, 40 inches high.

23. Vésuve.—Flowers 2¾ inches in diameter, colour good, but fades to a poor magenta; plant free-flowering, strong, 34 inches high.

49. William Oliver.—Flowers 2 inches in diameter, poor; ray florets very short; 34 inches high.

SECTION *g.*—*Flowers* CRIMSON.

30, 81. General Gaselee, **XX** June 11, 1915.—Flowers 3 inches in diameter, rounded, colour good; disc very bright yellow; peduncle leafy; plant free-flowering, strong, 35 inches high.

174. James Kelway, **A.M.** June 9, 1891.—Flowers 2¾ inches in diameter, colour bright, but inferior to 'Langport Scarlet'; 28 inches high.

13. Langport Scarlet, **XX** June 11, 1915.—Flowers 2½ inches in diameter, regular in outline, very bright colour; plant free-flowering, strong, 31 inches high.

52. Mrs. Cairns.—Flowers 2½ inches in diameter, brightly coloured; ray florets narrow; disc small; plant very weak, 26 inches high.

GROUP II.—FLOWERS DOUBLE.

SECTION *a.*—*Flowers* WHITE.

106. Aphrodite, **XX** June 11, 1915.—Flowers 3 inches in diameter, elegant; ray florets long; disc florets finely toothed, very clear white; plant free-flowering, strong, 28 inches high. The best variety of its class.

116. Dulcima.—A variety very like 'Aphrodite,' but the flowers are more round and the plant is much weaker; 23 inches high.

5. Lady Randolph Churchill.—Flowers 3¼ inches in diameter; central florets of disc creamy; ray florets broad; plant weak, 26 inches high.

140. Mont Blanc.—A variety very close to 'Aphrodite,' but more dwarf. The flowers are somewhat creamy, and the peduncle leafy; 27 inches high.

150. Pizarro.—Flowers small, inferior; plant weak, 25 inches high.

151. Princess de Metternich.—A variety very similar to 'Mont Blanc,' but not so free-flowering; 23 inches high.

153. Queen Alexandra.—Poor, out of character. Not the same variety as No. 12.

154. Samranburgh, **XX** June 11, 1915.—A variety with larger,

coarser, and hardly such clean flowers as 'Aphrodite,' but very free-flowering and vigorous in habit; 30 inches high.

156. Sylphide.—Flowers small and poor in quality, but one of the most continuous-flowering varieties; 30 inches high.

163. Virginale.—Poor, out of character.

164. White Aster.—Flowers 2¾ inches in diameter, almost globular; ray florets short; 23 inches high.

SECTION *b.*—*Flowers* tinged with YELLOW, especially in the younger florets.

113. Bon Ami.—Flowers 2¾ inches in diameter; ray florets broad; peduncle leafy; 31 inches high.

9, 161. Toison d'Or.—Flowers 2½ inches in diameter; ray florets long, drooping; plant of slender growth, 19 inches high.

165. Virgo.—Flowers 2¼ inches in diameter; ray florets broad; 24 inches high.

7, 167. Yvonne Cayeux.—Flowers 2½ inches in diameter, ragged in outline; ray florets long, somewhat quilled; peduncle bare; plant weak, 22 inches high.

SECTION *c.*—*Flowers* BLUSH.

117. Diomedes.—Flowers 2¾ inches in diameter, colour soft; ray florets broad; peduncle bare; plant free-flowering, strong, 34 inches high.

127. Godiva.—Flowers 2¾ inches in diameter, colour pale and soft; tips of disc florets long and twisted; 32 inches high.

15. Lady Derby.—Flowers 3¼ inches in diameter, colour soft; ray florets drooping; disc florets long; plant free-flowering, strong, 40 inches high.

132. Lady Kildare.—Flowers 2¾ inches in diameter, flushed cream colour; plant weakly, 24 inches high.

3. Leonard Kelway.—Flowers 3¼ inches in diameter; ray florets long, somewhat quilled; peduncle leafy, 31 inches high.

144. Modesty.—Flowers 2½ inches in diameter, rather pale; disc small; ray florets broad; 33 inches high.

146. Niobe.—Flowers 3¾ inches in diameter; ray florets somewhat quilled, drooping, produced continuously; 30 inches high.

56. Queen Mary, **A.M.** May 22, 1915.—Flowers 3½ inches in diameter; ray florets long, broad, drooping; disc creamy.

185. Richesse.—Flowers 3½ inches in diameter, pale, rather dull; ray florets drooping; 30 inches high.

10. Souce, **XX** June 11, 1915.—Flowers 4 inches in diameter; ray florets long, drooping; disc florets deeply toothed; plants strong, free-flowering, 28 inches high.

160. Uzziel.—Flowers 3 inches in diameter; ray florets slightly quilled, pointed, drooping; disc florets tinged yellow; plant free-flowering, strong, 31 inches high.

162. Voie Lactée.—Poor, out of character.

182. Wega.—Flowers 3½ inches in diameter, semi-double; ray florets long, drooping, pale; disc yellowish; plant weak, 28 inches high.

SECTION *d.*—*Flowers* PINK. (Rosolane purple 6′ b–d.)

105. Achilles.—Flowers 2¼ inches in diameter; ray florets short, recurved; plant weak, 20 inches high.

110. Boccace, **XX** June 11, 1915.—Flowers 2½ inches in diameter; ray florets short; disc florets dense, tipped yellow; peduncle leafy; 33 inches high. A distinct variety.

112. Chamois.—Flowers 3 inches in diameter; ray florets reflexed; disc much paler than ray florets; 29 inches high.

119. Duchess of Edinburgh.—Flowers 3 inches in diameter, flattened; ray florets long, horizontal; stems weak; 28 inches high.

123. Fulgens plenissimum, **XXX** June 11, 1915.—Flowers 3¼ inches in diameter, almost hemispherical; ray florets drooping; plant strong, free-flowering; 36 inches high.

129. Hermann Steiger.—Flowers 3 inches in diameter, pale; ray florets broad; disc dense; 32 inches high.

183. Le Dante, **XX** June 11, 1915.—Flowers massive, 3¾ inches in diameter, rather pale; peduncle leafy; plant strong, 24 inches high.

.2. Lord Rosebery.—Flowers 2¾ inches in diameter, rather pale; disc yellowish; plant weak, 27 inches high. See also No. 136.

137. Lycius.—Flowers 3 inches in diameter, semi-double; ray florets very long; disc small; peduncle bare; plant strong, 40 inches high. A variety very similar to 'Lord Rosebery,' but paler.

139. Magician.—Flowers 2½ inches in diameter; ray florets broad, short; disc florets yellowish; plant weak, 28 inches high.

1. Minnie Fowler.—Flowers poor, 3 inches in diameter, pale; ray florets twisted; plant weak, 28 inches high.

149. Psyche.—Flowers 3 inches in diameter, regular in outline; ray florets horizontal; 25 inches high.

157. Striatum plenum.—Flowers 2¾ inches in diameter, almost globular; ray florets drooping; plant free-flowering, strong, 32 inches high.

8, 166. Wilson Barrett, **A.M.** May 26, 1897.—Flowers 3 inches in diameter, hemispherical; ray florets long, drooping; plant free-flowering, strong, 26 inches high.

SECTION *e.*—*Flowers* LIGHT ROSE. (Rosolane purple 69′.)

104. Amethyst.—Flowers 3 inches in diameter, fade quickly; ray florets drooping; 30 inches high.

109. Anemonaeflorum sanguineum.—Flowers 3¼ inches in diameter, massive; ray florets broad; 29 inches high.

114. Captain Nares.—Flowers 3 inches in diameter, hemispherical, colour good; ray florets broad; 28 inches high.

121. Evelyn.—Flowers 2¾ inches in diameter, hemispherical; ray florets broad; plant strong, 31 inches high.

122. Gem, **XX** June 11, 1915.—Flowers 3¼ inches, hemispherical, colour pale but bright; ray florets broad; plant free-flowering, strong, 33 inches high.

125. Globe.—Flowers 2¾ inches in diameter, colour good; ray florets drooping; 30 inches high.

124. Gloire de Stella.—A stock of 'Globe,' *q.v.*

126. Haage und Schmidt.—A stock of 'Globe,' *q.v.*

128. Henri Murger.—A variety almost identical with 'Globe,' *q.v.*

131. Homerus.—Flowers 2¾ inches in diameter, colour bright; plant rather weak, 26 inches high.

130. Imbricatum plenum.—Flowers 3 inches in diameter, colour bright; plant very free-flowering, 30 inches high.

134. Louis Delasalle.—Flowers 2¾ inches in diameter, semi-double; ray florets drooping, wholly tinged orange; 28 inches high.

138. Mme. Patti.—Flowers semi-double, poor, out of character.

144. Marquis of Salisbury.—Flowers semi-double, 3 inches in diameter; plant free-flowering, 30 inches high.

143. Monsieur Barral.—Flowers 2¾ inches in diameter, bright colour, plant weak, 24 inches high.

147. Nero.—Flowers 2¾ inches in diameter; ray florets drooping; disc dull; plant few-flowered, 26 inches high.

4. Ovid.—Flowers 2½ inches in diameter; ray florets broad, stiff; disc florets white tipped; plant weak, 26 inches high.

148. Princess of Teck.—Flowers 2¾ inches in diameter; ray florets drooping; disc dull; peduncle bare; 35 inches high.

SECTION *f*.—*Flowers* DEEP ROSE. (Bright Amaranth purple 69 i.)

108. Alfred.—A stock of 'Alfred Kelway,' *q.v.*

57. Alfred Henderson, **A.M.** June 12, 1894.—Flowers 3½ inches in diameter; ray florets broad; disc florets deeply toothed; 31 inches high.

55. Alfred Kelway, **A.M.** June 7, 1892.—Flowers 3¼ inches in diameter; ray florets short; disc florets white tipped; peduncle leafy; 34 inches high.

107. Andromeda, **XX** June 11, 1915.—Flowers 3 inches in diameter; ray florets very long; disc florets few; peduncle bare; plant many-flowered, strong, 40 inches high.

58, 118. Ernest Kelway, **XX** June 11, 1915.—Flowers 3¾ inches in diameter, flattened, colour very bright; disc florets tipped white; peduncle leafy; plant many-flowered, strong, 30 inches high.

120. Figaro.—Flowers 3 inches in diameter, hemispherical; ray florets broad; plant many-flowered, strong, 30 inches high.

16. J. M. Twerdy, **XX** June 11, 1915.—Flowers 3 inches in diameter; ray florets recurved at tips; disc florets long, yellowish; peduncle bare; plant strong, 35 inches high.

6, 133. King Oscar.—Flowers 2¾ inches in diameter; disc florets white tipped; foliage very dark; 27 inches high.

135. Leonard Kelway.—A variety closely resembling 'Andromeda,' but with paler flowers.

136. Lord Rosebery.—Flowers 3¼ inches in diameter, semi-double, flattened, colour bright; plant strong, 27 inches high. Not the same variety as No. 2.

14. Murillo.—Flowers 2½ inches in diameter, flattened; ray florets long; peduncle leafy; 27 inches high. Not the same variety as No. 145.

11. Sir J. Miller.—Flowers 3 inches in diameter; ray florets drooping; disc florets tipped white; stem weak, 28 inches high.

FIG. 88.—THE ROGUE PEA (B) AND THE TYPICAL FORM (A) AMONG WHICH IT OCCURRED.

[To face p. 277.

EARLY PEAS TRIED AT WISLEY, 1915.

REPORT BY C. C. TITCHMARSH, Trials Officer.

THE invitation for seed for a Trial of Early Peas met with a ready response. For purposes of comparison a number of varieties which had previously received awards was obtained from various sources. One hundred and fifty stocks were grown in the trial.

The stocks were planted in groups according to the height as stated by the senders on the forms of entry and to the shape and colour of the seeds.

The seeds were sown in well-prepared ground on March 18. The germination, though not rapid, was regular.

Since the purpose of the trial was to select for award peas which came into bearing at an early date, the Judging Committee, before proceeding to make awards, decided to rule out, as not being early, all those stocks which were not ready for picking on a certain day. The date fixed upon was June 23, that date being ten days after the earliest pea in the trial was ready for picking. Of the stocks so excluded, some came into bearing soon after the 23rd, others were not in bearing at the time of the drafting of this report (June 29). It is, of course, possible that some of the former might prove earlier on other soils, but on the light soil of Wisley, with a season all in favour of earliness, they failed to qualify for inclusion in the trial.

Inasmuch as the labour connected with the trials is very great, it is hoped that on future occasions the senders of stocks will exercise the utmost care in entering those stocks only which conform strictly with the conditions of the trial. It is evident that peas, sown on March 18, which are not ready to pick by the end of June, can under no circumstances be classed as early.

Since a difference of a few days is of great importance among early crops, it has been found advisable to subdivide the early peas into two classes:

(a) The earliest, which includes those coming into bearing between June 14 and 19.

(b) The second early, those coming into bearing between June 20 and 23.

As is to be expected, the number of second-earlies is considerably larger than the number of first-earlies; and in that fact is justified the shorter period allowed for the second-early varieties. To have included stocks which were ready to pick on June 24 would have been to form an excessively large class of second-earlies.

Notwithstanding the drought which obtained throughout the growing period, the crop was excellent. This result was in no small

measure due to the thorough preparation of the soil and to constant attention to cultural details during the growing period. The cultivation of the plants was under the charge of the Superintendent and the garden foreman, Mr. J. Wilson.

In the seedling stage some of the plants suffered an attack from root maggot, which is a common pest at Wisley, and for which no remedy has been found. Happily the plants quickly grew out of this trouble.

Inasmuch as cross-fertilization does not occur in the pea, except in very exceptional circumstances, it was expected that the stocks would prove true to character. Although this was generally the case, there were, in a few stocks, a surprisingly high proportion of rogues. The most striking among the rogues were, of course, the "tare-leaved" forms, which only persistent roguing on the part of growers can keep under, and which appear to be constantly occurring among the ordinary stocks of peas. As is well known, the "tare-leaved" rogue pea is characterized by the leaf tips being pointed and not flattened, and by the possession of curled pods which bear peas of a peculiar and distinctive flavour. It does not, however, appear to be so well known that "tare-leaved" rogues exist not only in this well-defined form, but also as what may be called "incipient rogues," and that these "incipient rogues" give rise in the following generation, as Professor Bateson has shown, to thorough-going rogues. Hence in the roguing of peas it is important to eliminate the incipient as well as the well-marked tare-leaved forms (fig. 88).

A second class of rogues, which occurred in a large number of stocks, consisted of tall-growing forms which appear among dwarfs or semi-dwarfs. The present state of our knowledge indicates that the presence of such tall individuals is in all probability due to carelessness in some operation connected with the harvesting of the seeds.

A point which is worth bringing to the notice of growers is the frequency with which one-podded forms appear among stocks containing two-podded forms. Selection would eliminate the one-podded forms, but of course that must mean the rebuilding of the stocks from a single, uniformly two-podded plant. In this connexion it may be pointed out that not all plants which are fairly uniformly two-podded breed true to this character; on the other hand, some undoubtedly do so. It would, therefore, be necessary in building up a two-podded stock to start with several two-podded parents and keep the progeny of each separate until it had been ascertained in the next generation which was breeding true to two-poddedness.

Classification.—The system of classification adopted in the Table is as follows:—The stocks are first grouped into first- and second-early varieties. These groups are divided into four classes according to the height of the variety, and each class is subdivided according to seed form (round or wrinkled). *In this subdivision varieties with "dent" or slightly wrinkled seeds are classed with the round.* The varieties are arranged alphabetically under their seed character.

The pea which proved earliest, viz. No. 31, although it failed to

secure an award, is a plant of considerable interest in that it flowers on the fifth or sixth node. As the node on which a pea produces its first flowers is at least as good an index of its time of maturity as the actual date of fruiting—for evidently the latter is subject to many vicissitudes—this pea, flowering on so low a node, is in all probability the earliest pea yet produced. It is the more unfortunate, therefore, that it lacks other desirable qualities, but it may serve for purposes of cross-breeding. In this connexion it should be noticed that, as most growers are aware, an early crossed with a later pea gives in the first generation peas which arrive at maturity at an intermediate date, but rather nearer the later parent. These intermediate plants, when self-fertilized, give some peas as early as the early parent.

It is to be noted that the usual rough division of varieties into dwarf, semi-dwarf, and tall is insufficient. As a result of the comparison of the records it has been found necessary to make four categories, viz.:—Peas up to 1½ foot; above 1½ foot and under 3 feet; above 3 feet and under 4½; above 4½ feet and under 6.

The trial gives evidence that much effort is being devoted to the improvement of peas, such as two-poddedness, size of pod, and regularity of stature, particularly dwarfness. Those engaged in this work deserve the best thanks of the community for the success which has attended their efforts. One criticism may perhaps be hazarded: that is, that many raisers appear to be seeking for size at the sacrifice of flavour.

Those familiar with the history of varieties of peas will note with interest that, as shown in the accompanying table, certain stocks of well-known varieties have in the course of selection lost their earliness. Cases in point are 'Ameer,' and certain selections of 'The Pilot' and 'William I.'

List of Varieties.*

1., 2.	Bijou Forcing.	17.	Referendum.
3., 4.	Chelsea Rival.	18., 19.	Pioneer.
5.	King of the Dwarfs.	20., 21.	English Wonder.
6., 7.	Peter Pan.	22.	Marvellous.
8., 9.	The Sherwood.	23., 24.	Excelsior.
10., 11., 12., 13.	Laxtonian.	25.	Green Gem.
		26.	Reading Wonder.
		27.	Prince Arthur.
		28.	Top of the Morn.
		29.	38/1.
14.	Laxtonian Improved.	30.	71/70.
15., 16.	Hundredfold.	31.	126/11.
		32.	130/34.

* See footnote, p. 117.

33. Connoisseur (re-selected).
34. Prelude.
35. 140/20.
36. American Wonder.
37. Forcing Toogood's.
38. Early Favourite.
39. Edward VII.
40.–43. Little Marvel.
44.–45. Connoisseur.
46. Surprise.
47. Witham Wonder.
48. William Hurst.
49. Certain Satisfaction.
50. Improved Stanley.
51. Easton Early.
52. Harbinger (Sutton's).
53. Timperley Wonder.
54. Lancashire Lad.
55. Sutton's Seedling.
56. Kelvedon Wonder.
57. 126/14.
58. 38/6.
59. 38/8.
60. 92/18.
61. Superb.
62. 25/23.
63. 25/24.
64. A1.
65. Duchess of York.
66. First of the Season.
67. Ideal.
68. James Kelway.
69. Early Queen.
70. May Queen.
71. Union Jack.
72. Early Favourite.
73. Model.
74. 127/11.
75.–76. Benefactor.
77. Early Perfection.
78. Express (Dobbie's).
79. Glory of Somerset.
80.–81. Gradus.
82. Thomas Laxton.
83.–84. World's Record.
85. Exonian.
86. Early Giant.
87. First of All Improved.
88. William I.
89. William I. Improved.
90. Chantecler.
91. 124/74.
92. Bountiful.
93. Forerunner.
94.–95. Superb.
96. Sea Lord.
97. 132/20.
98. The Pilot.
99. Prosperity.
100. 85/73.
101. Acquisition.
102. Extra Early Blue Seedling.
103. Bountiful.
104. Earliest Blue.
105. Market Surprise.
106. Lightning.
107. Giant Lightning.
108. Ameer.
109.–110. British Lion.
111. Hardy Norseman.
112. The Pilot (Hawlmark Selection).
113. The Pilot (Re-selected).
114. Double-podded Pilot.
115. Primo.
116. Ringleader Improved.
117. Western Express.
118. New Early Wrinkled.
119. First of All.
120. Empress of India.
121. The Langport.
122. Gradus.
123. 47/50.
124. 288.
125. Marvellous.
126. Sixty Days.
127. American Wonder (Re-selected).
128. Early Daisy.

129. Forcing Re-selected (Carter's).
130. Mayflower.
131. Daffodil.
132. Eight Weeks.
133. Round Blue Seedling.
134. Early Duke.
135. Paris Market.
136. Daylight.
137. Springtide Re-selected.
138. Lightning.
139. Dawn.
140. Early Morn.
141. Giant Lightning.
142. The Pilot (Select).
143. Giant Express.
144. Snowdrop.
146. Daisy.
150. The Ameer.

The following varieties were selected as the most meritorious :—

First-Early Varieties.

1 to $1\frac{1}{2}$ foot.

American Wonder. Harbinger (Sutton's). Prelude.

2 to 3 feet.

Kelvedon Wonder.

$3\frac{1}{2}$ to $4\frac{1}{2}$ feet.

Chantecler. Early Queen. Express (Dobbie's).
First of the Season. May Queen. Model.
World's Record.

5 to 6 feet.

A1 The Pilot (Hawlmark Selection).
William I. (Improved).

Second-Early Varieties.

2 to 3 feet.

Sixty Days.

$3\frac{1}{2}$ to $4\frac{1}{2}$ feet.

British Lion.

5 to 6 feet.

Bountiful. Dawn. Duchess of York.
Giant Express. Thomas Laxton. William I.

Description of Varieties to which Awards were made.

First-Early Varieties.

64. A1, **A.M.** July 20, 1915.—Height 5 feet; haulm fairly thick, rather light; internodes long, branching 18 inches above ground level, flowering node 6–7; pods borne singly, straight, stump ended, $3\frac{1}{4}$ inches long, not inflated, pale; peas large, round, 7 in a pod, flavour good; seed wrinkled, green. In flower 69 days, in full flower 74 days, ready to pick 92 days from date of sowing.

36. American Wonder, **XXX** July 20, 1915.—Height 1 foot; haulm wiry, dark; internodes short, branching weakly at and above ground level, flowering at node 8; pods borne mostly in pairs, straight, stump ended, $2\frac{1}{2}$ inches long, not inflated, pale; peas of medium size, round, 6 in a pod, flavour good; seeds wrinkled, green. In flower 71 days, in full flower 75, ready to pick 91 days from date of sowing.

90. Chantecler, **XXX** July 20, 1915.—Height 4–4½ feet; haulm sturdy, pale; internodes long, branching weakly at ground level and a little above, flowering at node 7 or 8; pods borne singly, slightly curved, stump ended, 3½ inches long, inflated, pale; peas large, angular, loose in the pod, 6 in a pod, flavour good; seeds wrinkled, yellow. In flower 69 days, full flower 72 days, ready to pick 90 days from date of sowing.

78. Dobbie's Express, **XXX** July 20, 1915.—Height 4 feet; haulm thick, pale; internodes long, not branching, flowering at node 7 or 8; pods borne singly, slightly curved, stump ended, 3¾ inches long, not inflated, dark, each containing 9 medium-sized, round, compact peas; flavour good; seeds wrinkled, green, few yellow. In flower 69 days, in full flower 72 days, ready to pick 90 days from date of sowing.

69. Early Queen, **XXX** July 20, 1915.—Differs from 'May Queen' (*q.v.*), from which it is a selection, only in having pointed pods.

66. First of the Season, **XXX** July 20, 1915.—Height 4 feet; haulm fairly stout, pale; branching at ground level, internodes long, flowering at node 9; pods borne mostly in pairs, slightly curved, pointed, 3¾ inches long, inflated, pale, containing 7 medium-sized, round, loosely packed peas of fair flavour. In flower 69 days, in full flower 72 days, ready to pick 92 days from date of sowing.

56. Kelvedon Wonder, **XXX** July 20, 1915.—Height 2½ feet; haulm stout, dark; branching weakly above ground level, internodes short, flowering at node 8; pods borne mostly in pairs, straight, pointed, 2½ inches long, not inflated, dark, containing six medium-sized, angular, tightly packed peas, of fair flavour; seed wrinkled, green. In flower 71 days, in full flower 75 days, ready to pick 92 days from date of sowing.

70. May Queen, **XXX** July 20, 1915.—Height 4 feet; haulm rather slender, pale; branching weakly at ground level, internodes long, flowering at node 8 or 9; pods borne singly, straight, stump ended, 3½ inches long, inflated, pale, containing 7 or 8 large, round, tightly packed peas of good flavour; seed wrinkled, green, with a few yellow. In flower 70 days, in full flower 74 days, ready to pick 92 days after date of sowing.

73. Model, **XXX** July 20, 1915.—Height 4½ to 5 feet; haulm slender, rather dark; branching at ground level or unbranched, internodes long, flowering at node 7; pods borne singly, straight, stump ended, 3½ inches long, inflated, dark, containing medium-sized, loosely packed, angular peas of fair flavour; seed wrinkled, green. In flower 70 days, in full flower 74 days, ready to pick 92 days after date of sowing.

34. Prelude, **A.M.** July 1, 1913, **Confirmed** July 20, 1915.—Height 1 foot; haulm thin, pale; unbranched, internodes short, flowering at node 7; pods borne mostly singly, slightly curved, pointed, not inflated, pale, 3 inches long, containing 6 or 7 moderate-sized, round, tightly packed peas of good flavour; seed wrinkled, yellow, few green. First flower 69 days, in full flower 75 days, ready to

pick 91 days after sowing. This variety should be sown thickly to achieve the best results.

52. Sutton's Harbinger, **A.M.** June 20, 1901, **Confirmed** July 20, 1915.—Height 1½ foot; haulm stout, pale; branching at soil level and above, internodes short, flowering at node 8; pods borne singly, flattened, straight, stump ended; 3 inches long; not inflated, pale, bearing 6 or 7 medium-sized, loosely-packed peas of fair flavour; seed wrinkled, green. In flower 71 days, in full flower 75 days, ready to pick 92 days after date of sowing.

112. The Pilot, Hawlmark Selection, **XXX** July 20, 1915.—Height 3½ to 4 feet; haulm fairly stout, pale; branching weakly at ground level and strongly above, internodes fairly long, flowering at node 9 or 10; pods generally single, straight, pointed, 4 inches long, not inflated, dark, bearing 8 or 9 large, angular, tightly packed peas of fair flavour; seed somewhat wrinkled, yellow and green. In flower 68 days, in full flower 73 days, ready to pick 94 days after sowing.

89. William I. Improved, **F.C.C.** 1872, **Confirmed** July 20, 1915. —A selection of the above variety, described under Second-Early, which reaches 6 feet in height, and bears blunt pods, more regularly in pairs, 6 days earlier, and with many green seeds.

83. World's Record, **A.M.** July 20, 1915.—Height 4 to 4½ feet; haulm thin, dark; much branched at ground level, internodes long, flowering at node 8 or 9; pods borne singly, slightly curved, pointed, 4½ inches long, not inflated, rather dark, containing 9 moderate-sized, round, loosely packed peas of fair flavour; seed wrinkled, yellow and green. In flower 68 days, in full flower 75 days, ready to pick 91 days after sowing.

SECOND-EARLY VARIETIES.

92. Bountiful, **XXX** July 20, 1915.—Height 5 feet; haulm thin, pale; branching strongly at ground level and less strongly above, internodes long, flowering at node 10 to 12; pods borne mostly singly, curved, pointed, 3½ inches long, inflated, pale, containing 8 moderate-sized, round, loosely packed peas of good flavour; seed round, green. In flower 75 days, in full flower 79 days, ready to pick 98 days after sowing.

109. British Lion, **XXX** July 20, 1915.—Height 4 feet; haulm stout, fairly dark; internodes fairly long, branching vigorously above ground level, flowering at node 12; pods borne in pairs, slightly curved, pointed, not inflated, dark, 3¼ inches long, bearing 7 or 8 moderate-sized, round, loosely packed peas of fair flavour; seed wrinkled, green. In flower 72 days, in full flower 76 days, ready to pick 98 days after sowing.

139. Dawn, **A.M.** July 20, 1908, **Confirmed** July 20, 1915.—Height 4½ to 5 feet; haulm stout, fairly dark; branching vigorously above ground level, internodes long, flowering at node 12 or 13; pods borne in pairs, straight, stump ended, slightly inflated, dark, 3½ inches long, containing 9 large, angular, lightly packed peas of good flavour;

seed wrinkled, yellow and green. First flower 71 days, in full flower 76 days, ready to pick 98 days after sowing.

65. Duchess of York, **A.M.** June 20, 1901, **Confirmed** July 20, 1915.—Height 4½ to 5 feet; haulm fairly thick, dark; branching above ground level, internodes long, flowering at node 10; pods borne mostly singly, straight, stump ended, dark, inflated, 3¾ inches long, containing 8 large, round, loosely packed peas of good flavour; seed wrinkled, green. First flower 75 days, in full flower 80 days, ready to pick 98 days after sowing.

143. Giant Express, **A.M.** July 20, 1915.—Height 4 to 5 feet; haulm rather light, rather thin; unbranched or branching weakly at ground level, internodes long, flowering at node 9; pods borne mostly singly, slightly curved, stump ended, not inflated, pale, 3¼ inches long, containing 8 moderate-sized, angular, tightly packed peas of fair flavour; seed round, green. First flower 72 days, in full flower 75 days, ready to pick 98 days after sowing.

126. Sixty Days, **XXX** July 20, 1915.—Height 2 feet; haulm thin, dark; unbranched or branching weakly at ground level, internodes very short, flowering at node 9; pods borne mostly singly, slightly curved, pointed, not inflated, dark, 3½ inches long, containing 8 moderate-sized, round, loosely packed peas of fair flavour; seed wrinkled, green, few yellow. First flower 70 days, in full flower 74 days, ready to pick 98 days after sowing.

82. Thomas Laxton, **A.M.** July 5, 1898, **Confirmed** 1915.—Height 4½ to 5½ feet; haulm fairly thick, fairly light; branching slightly above ground level, internodes long, flowering at node 9; pods borne singly, straight, stump ended, inflated, dark, 4 inches long, containing 8 moderate-sized, angular, loosely packed peas of good flavour; seed wrinkled, green and yellow. First flower 70 days, in full flower 74 days, ready to pick 98 days after sowing.

88. William I., **F.C.C.** 1872, **Confirmed** July 20, 1915.—Height 4½ to 5 feet; haulm stout, dark; branching both at ground level and above, internodes long, flowering at node 8 or 9; pods borne mostly in pairs, curved, pointed, 2½ to 3 inches long, not inflated, dark, bearing 8 or 9 small, round, loosely packed peas of fair flavour; seed dent, yellow. In flower 70 days, in full flower 74 days, ready to pick 97 days after sowing.

The following varieties matured subsequently to June 23, the date fixed for delimiting the Second-Earlies:

	Date of Maturity
127. American Wonder Re-selected, from Messrs. Carter	June 24
3, 4. Chelsea Rival, from Messrs. Dawkins, Dobbie	June 25
44, 45. Connoisseur, from Messrs. Hurst, Barr	after June 25
131. Daffodil, from Messrs. Carter	after June 25
128. Early Daisy, from Messrs. Carter	after June 25
72. Early Favourite (Clibran's), from Messrs. Clibran	after June 25
38. Early Favourite (Webb's), from Messrs. Webb	after June 25
51. Easton Early, from Mr. Best	June 24
39. Edward VII., from Messrs. Barr	after June 25
79. Glory of Somerset, from Messrs. Kelway	after June 25
80, 81, 122. Gradus, from Messrs. Simpson, Dobbie, Barr	after June 25

	Date of Maturity.
50. Improved Stanley, from Messrs. Hurst	after June 25
68. James Kelway, from Messrs. Kelway	after June 25
54. Lancashire Lad, from Mr. Yates	after June 25
124. No. 288, from Messrs. Carter	after June 25
125. Marvellous, from Messrs. Carter	after June 25
130. Mayflower, from Messrs. Carter	after June 25
99. Prosperity, from Messrs. Toogood	after June 25
17. Referendum, from Messrs. Kelway	after June 25
96. Sea Lord, from Messrs. Toogood	after June 25
55. Sutton's Seedling, from Messrs. Sutton	June 24
121. The Langport, from Messrs. Kelway	after June 25
8, 9. The Sherwood, from Messrs. Barr, Simpson	after June 25
37. Toogood's Forcing, from Messrs. Toogood	after June 25
71. Union Jack, from Messrs. Dobbie	after June 25
10. Warwickshire Pride, from Messrs. Simpson	after June 25
117. Western Express, from Messrs. R. Veitch	after June 25
57. No. 126/14 from Messrs. Hurst	after June 25
58. No. 38/6 from Messrs. Hurst	after June 25
59. No. 38/8 from Messrs. Hurst	after June 25
60. No. 92/8 from Messrs. Hurst	June 24
63. No. 25/24 from Messrs. Hurst	June 24

[*For general particulars see next page.*

		NO. I.	NAME OF VARIETY II.	Award in Previous Trials III.	AWARD IN PRESENT TRIAL IV.	REMARKS V.	SENDER VI.	RAISER VII.	INTRODUCER VIII.	NO.
FIRST-EARLY VARIETIES										
Up to 1½ foot	Seed round	132	Eight Weeks . .	—	—	—	Carter	—	Carter	132
	Seed wrinkled	36	American Wonder. .	—	XXX	Contained 3 rogues	Sutton	—	Sutton (1881)	36
		52	Harbinger (Sutton's) .	A.M. (1901)	A.M. Confd.	—	Sutton	Sutton	Sutton (1898)	52
		34	Prelude	A.M. (1913)	A.M. Confd.	—	Hurst	Hurst	Hurst	34
		26	Reading Wonder . .	—	—	—	Sutton	Sutton	Sutton (1908)	26
		29	38/1	—	—	—	Hurst	Hurst	Hurst	29
		35	140/20 . . .	—	—	—	Hurst	Hurst	Hurst	35
		56	Kelvedon Wonder. .	—	XXX	—	Hurst	Hurst	Hurst	56
Above 1½ and under 3 feet	Seed wrinkled	6, 7	Peter Pan . . .	—	—	—	Barr, Sydenham	—	Watkins & Simpson	6, 7
		31	126/11	—	—	—	Hurst	Hurst	Hurst	31
Above 3 and under 4½ feet	Seed round	105	Market Surprise . .	—	—	—	Hurst	Hurst	Hurst	105
		138	Lightning	—	—	—	Carter	—	Carter	138
		102	New Extra Early Blue .	—	—	—	Dickson	Dickson	—	102
		111	Hardy Norseman . .	—	—	—	Simpson	Simpson	Simpson	111
		116	Ringleader (Improved) .	—	—	—	Sutton	Sutton	Sutton	116
		112	The Pilot (Hawlmark Selection)	—	XXX	—	Dickson	Dickson	Hurst	112
		100	85/73	—	—	—	Hurst	Hurst	Hurst	100
		90	Chantecler . . .	—	XXX	—	Hurst	Hurst	Hurst	90
	Seed wrinkled	136	Daylight	—	—	—	Carter	—	Carter	136
		77	Early Perfection . .	—	—	—	Toogood	—	Toogood	77
		69	Early Queen . .	—	XXX	—	Barr	—	Barr	69
		78	Express (Dobbie's) .	—	XXX	—	Dobbie	—	—	78
		66	First of the Season .	—	A.M.	—	Cooper, Taber	—	Cooper, Taber	66
		119	First of All . . .	—	—	—	Sutton	Sutton	Sutton (1910)	119
		87	First of All (Improved) .	—	—	—	Hurst	—	Hurst	87
		67	Ideal	F.C.C. (1903)	—	—	Sutton	Sutton	Sutton	67

Above 3 and under 4½ feet	Seed wrinkled	70	May Queen	—	XXX	—	Sutton	Sutton	Sutton (1893)	70
		137	Springtide	—	—	—	Carter	—	Carter	137
		83	World's Record	—	A.M.	—	Sutton	Sutton	Sutton (1907)	83
		123	47/50	—	—	—	Hurst	Hurst	Hurst	123
		73	Model	—	XXX	—	Hurst	Hurst	—	73
		32	130/34	—	—	—	Hurst	Hurst	Hurst	32
		74	127/11	—	—	—	Hurst	Hurst	Hurst	74
Above 4½ and under 6 feet	Seed round	108	Ameer	A.M. (1901)	—	—	Barr	—	Hurst	108
		113	The Pilot (Re-selected)	—	—	—	Webb	—	Webb	113
	Seed wrinkled	89	William I. Improved	F.C.C. (1872)	A.M. Confd.	—	Sutton	Laxton	—	89
		64	A1	—	A.M.	—	Sutton	Sutton	Sutton (1891)	64
		85	Exonian	F.C.C. (1887)	—	—	R. Veitch	R. Veitch	R. Veitch	85
SECOND-EARLY VARIETIES										
Up to 1½ foot	Seed wrinkled	33	Connoisseur (Re-selected)	—	—	Dwarfer and earlier than original stock, but not fixed.	Hurst	Hurst	Hurst	33
		20	English Wonder	—	—	Darker than original stock.	Barr	—	—	20
		21	English Wonder	—	—	—	Dobbie	—	—	21
		25	Green Gem	A.M. (1905)	—	—	Sutton	Sutton	Sutton (1901)	25
		5	King of the Dwarfs	—	—	—	Sutton	Sutton	Sutton (1903)	5
		22	Marvellous	—	—	Stock contains several rogues	Barr	Hurst	Hurst	22
		27	Prince Arthur	—	—	—	Sutton	Sutton	Sutton (1910) as second-early	27
Above 1½ and under 3 feet	Seed round	30	71/70	—	—	—	Hurst	Hurst	Hurst	30
		133	Round Blue Seedling	—	—	—	Carter	Laxton	—	133
		61, 94, 95	Superb	—	—	—	Hurst, Dobbie, Barr	Laxton	—	61, 94, 95
		62	5/23	—	—	—	Hurst	Hurst	—	62

		NO. I.	NAME OF VARIETY II.	Award in Previous Trials III.	AWARD IN PRESENT TRIAL IV.	REMARKS V.	SENDER VI.	RAISER VII.	INTRODUCER VIII.	NO.
SECOND-EARLY VARIETIES.—*cont.*										
Above $1\frac{1}{2}$ and under 3 feet	Seed wrinkled	1, 2	Bijou Forcing	—	—	—	Hurst, Barr	Hurst	Hurst	1, 2
		129	Carter's Forcing (Re-selected)	—	—	—	Carter	—	Carter	129
		49	Certain Satisfaction	—	—	—	Toogood	Toogood	Toogood	49
		145	Chelsea Gem	F.C.C. (1897)	—	—	Purchased	J. Veitch	J. Veitch	145
		146	Daisy	F.C.C. (1902)	—	—	Purchased	Carter	Carter	146
		23, 24	Excelsior	A.M. (1905)	—	—	Barr, Sutton	Sutton	Sutton (1896)	23, 24
		15, 16	Hundredfold	A.M. (1910)	—	—	Barr, Sutton	Sutton	Sutton (1910)	15, 16
		11	Laxtonian	—	—	Not the original stock.	Simpson	—	—	11
		12, 13	Laxtonian	A.M. (1910)	—	This variety contains characteristic rogues.	Dobbie, Barr	Laxton	Laxton	12, 13
		14	Laxtonian Improved	—	—	—	Laxton	Laxton	Laxton	14
		40, 41, 42, 43	Little Marvel	A.M. (1902)	—	No. 42 is a poor stock	Sutton, Sydenham, Webb, Barr	Sutton	Sutton (1900)	40, 41, 42, 43
		18, 19	Pioneer	—	—	—	Barr, Sutton	Sutton	Sutton (1907)	18, 19
		126	Sixty Days	—	XXX	—	Carter	Carter	Carter	126
		46	Surprise	—	—	—	Webb	Webb	Webb	46
		28	Top of the Morn	—	—	Contains many tall rogues.	Laxton	Laxton	Vaughan	28
		48	William Hurst	—	—	A pale-podded stock	Barr	Hurst	—	48
		47	Witham Wonder	—	—	—	Barr	Cooper Taber	Cooper Taber	47
Above 3 and under $4\frac{1}{2}$ feet	Seed round	75, 76	Benefactor	—	—	—	Hurst, Barr	Holmes	Hurst	75, 76
		109, 110	British Lion	—	XXX	—	Dickson, Barr	Cullen	—	109, 110

Above 3 and under 4½ feet	Seed round	106	Lightning	—	—	Cf. 130, First-Early	Barr	Carter	Carter	106
		115	Primo	—	—	—	Barr	—	Watkins & Simpson	115
		98	The Pilot	A.M. (1903)	—	Cf. 113.	Barr	Dickson	—	98
		142	The Pilot (Select)	—	—	A dark form of the original stock	Carter	—	Laxton	142
		88	William I.	F.C.C. (1872)	A.M. Confd.	Cf. 89.	Barr	Laxton	Laxton	88
		97	132/20	—	—	—	Hurst	Hurst	Hurst	97
	Seed wrinkled	134	Early Duke	A.M. (1910)	—	—	Carter	Carter	Carter	134
		120	Empress of India	—	—	—	Sutton	Sutton	Sutton (1892)	120
		118	New Early Wrinkled	—	—	—	Hurst	Holmes	Hurst	118
		84	World's Record	—	—	This is not the same stock as No. 83 above	Barr	Sutton	—	84
Above 4½ and under 6 feet	Seed round	101	Acquisition	—	—	—	Sutton	Sutton	Sutton (1914)	101
		92, 103	Bountiful	—	XXX	—	Barr, Sutton	Sutton	Sutton (1892)	92, 103
		114	Double-podded Pilot	—	—	No more double-podded than the original stock	Dickson	Dickson	—	114
		104	Earliest Blue (New Strain)	—	—		Sutton	Sutton	Sutton (1915	104
		93	Forerunner	—	—	—	Toogood	Toogood	Toogood	93
		143	Giant Express	—	A.M.	—	Carter	Carter	Carter	143
		107, 141	Giant Lightning	—	—	—	Barr, Carter	Carter	Carter	107, 141
	Seed wrinkled	150	Ameer	A.M. (1901)	—	—	Purchased	—	Hurst	150
		139	Dawn	A.M. (1908)	A.M. Confd.	—	Carter	Carter	Carter	139
		65	Duchess of York	A.M. (1901)	A.M. Confd.	—	Sutton	Sutton	Sutton (1901)	65
		140	Early Morn	A.M. (1899)	—	As a forcing variety	Carter	—	Carter	140
		135	Paris Market	—	—	—	Carter	Carter	Carter	135
		144	Snowdrop	A.M. (1903)	—	—	Carter	Carter	Carter	144
		82	Thomas Laxton	A.M. (1898)	A.M. Confd.	—	Barr	Laxton	Laxton	82
		91	124/74	—	—	—	Hurst	Hurst	Hurst	91

EARLY AND MID-SEASON POTATOS AT WISLEY, 1915.

Report by the Trials Officer.

One hundred and eleven stocks were sent for trial, and were planted, together with fourteen other stocks obtained for comparison, on April 9. There were in the trial one hundred and seven varieties, viz. forty-five First-Early, thirty-two Second-Early, and thirty Mid-season. They were planted in rows two feet six inches apart, with eighteen inches between the sets in the row, on ground that was deeply dug and moderately manured the previous autumn.

The season was not altogether a good one for Potatos; many stocks were " cut " by the frost which occurred on the last day of May, and the disease caused by *Phytophthora infestans* severely checked many of the Mid-season varieties, but in spite of these drawbacks and the dry spring the majority of the plants made excellent growth and produced good crops, in most instances free from disease. The cultivation was under the charge of Mr. J. Wilson, Foreman in Vegetable Department. A Sub-Committee of the Fruit and Vegetable Committee inspected the trial on July 29 and August 19, and recommended that the following varieties, by reason of their heavy crops and good appearance, should be cooked for inspection of their quality by the full Committee, viz. :—

Arduthie Seedling.	Midlothian Early.
Arran Beauty.	Myatt's Ashleaf.
Arran Chief.	Ninety-fold.
Carisbrooke Castle.	Old Yellow Ashleaf.
Centenary.	Sharpe's Express.
Dalmeny Beauty.	Sir John Llewelyn.
Denbigh Castle.	Stirling Castle.
Duke of York.	Stretton No. 9.
General Joffre.	,, ,, 20.
Great Scot.	Tremendous.
Gladiator.	Triumph.
Hero King.	Windsor Castle.
Imperial Beauty.	Witchill Seedling.
May Queen.	Wolfe's Secundus.

The Committee considered the following varieties to be the best in the trials :—

First-Early Varieties.

Duke of York.	Midlothian Early.

SECOND-EARLY VARIETIES.

General Joffre.
Old Yellow Ashleaf.
Sharpe's Express.
Sir John Llewelyn.
Stirling Castle.
Witchill Seedling.

MID-SEASON VARIETIES.

Arran Chief.
Great Scot.
Stretton No. 20.
Wolfe's Secundus.

LIST OF VARIETIES.*

1., 2. Ninety-fold, I*a*
3. Colonist, I*a*
4. Sweethope Early, I*a*
5., 6. Midlothian Early, I*c*
7. Old Yellow Ashleaf, II*a*
8. Myatt's Prolific Ashleaf, II*a*
9. Myatt's Ashleaf, I*a*
10. Ashleaf Selected, II*a*
11. Gladiator, II*a*
12., 13. Sir John Llewelyn, II*a*
14. Ringleader, I*a*
15. Denbigh Castle, I*a*
16. Duke of York, I*e*
17. Sharpe's Express, II*a*
18. Express, II*a*
19. Sharpe's Express, II*a*
20. Express, II*a*
21. First Crop, I*a*
22. Western Hero, I*a*
23., 24. Witchill Seedling, I*a*
25., 26. May Queen, I*a*
27. Best of All, II*c*
28. Dunnottar Castle, I*c*
29. Carisbrooke Castle, I*c*
30. Stretton No. 1, I*c*
31. General Joffre, II*d*
32. Advancer, I*a*
33., 34. Milecross Early, I*c*
35. Alpha, I*e*
36. Sir John Llewelyn, II*a*
37. Duke of York, I*e*
38. The Colleen, II*e*
39. Harbinger, II*e*
40. Stretton No. 7, II*a*
41. Stretton No. 4, II*a*
42. Purple Eyes, II*e*
43., 44. Snowdrop Selected, I*a*
45. Hawlmark Express, II*a*
46. The Prizewinner, II*a*
47. The Gadstock, I*a*
48. Guardian, I*c*
49. Sharpe's Victor, I*a*
50. Mr. Bresse, I*b*
51. Exhibition Red Kidney, II*b*
52. Bogbrae Dreadnought, II*b*
53. Bogbrae Black Watch, II*b*
54. Cruden Conqueror, I*d*.
55. Bogbrae Gordon Highlander, II*b*
56. Dalmeny Early, I*c*
57. Hero King, I*c*
58. The Duchess, I*c*
59. Edinburgh Castle, II*a*
60., 61. Epicure, I*e*
62. Dalmeny Beauty, I*a*
63. Regina, II*e*
64. The Chiltern, I*e*
65. Southampton Wonder, III*e*
66. Acquisition, III*e*
67. Conquest, III*c*
68. Arran Beauty, III*e*
69., 70. British Queen, III*e*

* See footnote, p. 117.

71., 72. Great Scot, III*e*
73. King George V., II*e*
74. Favourite, III*e*
75. Wolfe's Secundus, III*e*
76., 77. Windsor Castle, III*e*
78. Warwick Castle, III
79. Stirling Castle, III*e*
80. Stretton No. 5, III*e*
81. Auquharney Roundhead, III*e*
82. Mauve Queen, III*f*
83. Climax, II*f*
84. Eighty-fold, II*f*
85. Supreme, II*a*
86. Brydon's Crampton, II*a*
87. Stretton No. 9, II*a*
88. Toogood's Triumph, I*a*
89. White City, III*a*
90. Imperial Beauty, I*a*
91. Money Maker, I*e*
92. Chieftain, II*a*
93. Sir Edward Carson, III*a*
94. William Peters, I*c*
95. Stretton No. 20, III*a*
96. Stretton No. 6, III*c*
97. Tremendous, III*e*
98. Darlington, III*e*
99. Punta Arenas, III*e*
100. Balmoral Castle, III*e*
101. Arran Chief, III*e*
102. Mainstay, III*e*
103. Raynes Park White, III*e*
104. Five Mile Town, I*e*
105. Goldfinder, II*e*
106. Carter's Goldfinder, II*a*
107. Scarlett's Top, II*e*
108. Pride of Scotland, III*e*
109. Cigarette, I*e*
110. Centenary, I*e*
111. Russet Queen, I*e*
112. Scottish Chief, II*e*
113. Irish King, I*e*
114. Stretton No. 21, III*e*
115. Stretton No. 2, III*f*
116. Stretton No. 3, III*f*
117. King Edward VII., III*a*
118. Arduthie Seedling, I*c*
119. Midsummer Early, I*e*
120. Sargent's Seedling, I*a*
121. Denbigh Castle, I*a*
122. Sharpe's Victor, I*a*
123. Beauty of Hebron, I*b*
124. Grosvenor Beauty, I*c*
125. Long Set, I*e*

F.C.C. = First-class Certificate.
A.M. = Award of Merit.
XXX = Highly Commended.
XX = Commended.

I. First-Early Varieties.

a. Tubers Kidney, white or yellow.

32. Advancer (*Carter* *).—Plant small, uniform, erect, tinged purple-bronze; foliage small, wrinkled; flower-buds drop before maturity; tubers rather small; skin smooth, white; eyes very shallow; eyebrows inconspicuous; flesh firm, white. 33 lb. (Scotch seed.)

3. Colonist (*Webb*).—Plant medium, fairly erect, tinged; habit very irregular; foliage mostly large; flowers white, mostly drop; tubers medium size; skin smooth, white; eyes shallow; eyebrows inconspicuous; flesh firm, white. 42 lb. A clean sample. (Worcestershire seed.)

* The name in ordinary type is that of the sender of the variety to the trial; that in italics, that of the raiser or introducer, where known. When only one name is printed and in italics it indicates that the sender was also the raiser or introducer.

62. Dalmeny Beauty (Sydenham), **A.M.** September 11, 1903.—Plant small, irregular, fairly erect, green; foliage medium, smooth; flowers coloured; tubers fairly large; skin smooth white; eyes few, shallow; eyebrows prominent; flesh firm, white. 15 lb. A poor, irregular stock. (Lincolnshire seed.)

*15, *121. Denbigh Castle, **F.C.C.** July 10, 1900.—Plant, medium, not very uniform, slightly tinged; foliage small, wrinkled, light green; not flowering; tubers rather small; skin yellowish, smooth; eyes few, very shallow; eyebrows prominent; flesh rather soft, white. 15 and 22 lb.; many chats.

21. First Crop (*Webb*).—Similar to 'Sir John Llewelyn' but earlier in this trial. 42 lb. (Dumfries seed.)

90. Imperial Beauty (Barr; *Marsh*), **A.M.** July 30, 1912.—Plant medium, uniform, erect; foliage medium fairly smooth; flowers absent; tubers of medium size; skin rather rough, yellow; eyes rather many, fairly shallow; eyebrows inconspicuous; flesh firm, white. 47 lb.; many chats. (Scotch seed.)

25, 26. May Queen (Dickson, Sutton; *Sutton*), **A.M.** August 15, 1905.—Plant fairly large, uniform, erect, green; foliage large, smooth; flower-buds drop; tubers many, medium size; skin smooth, white; eyes few, shallow; eyebrows prominent; flesh firm, white. 37 and 48 lb. (Newtownards and Scotch seed.)

9. Myatt's Ashleaf (Simpson).—Plant medium, uniform, fairly erect, slightly mottled; foliage medium, fairly smooth; flowers pinkish; tubers many, small; skin smooth, white; eyes medium in number, deep; eyebrows prominent; flesh firm, yellow. 31 lb.; many chats. (Lincolnshire seed.)

1, *2. Ninety-fold (Barr; *Sutton*), **A.M.** July 10, 1900.—Plant medium, spreading, tinged; foliage medium, generally wrinkled; flower white; tubers of medium size; skin smooth, white; eyes rather deep; eyebrows inconspicuous; flesh firm, white. 29 and 64 lb.; many chats. (No. 1 Lincolnshire seed.)

*14. Ringleader, **A.M.** July 10, 1900.—Plant medium, uniform, erect, tinged; foliage medium, generally wrinkled; not flowering; tubers many, rather small; skin smooth, white; eyes few, shallow; eyebrows prominent; flesh white. 34 lb., very uniform.

120. Sargent's Seedling (*Sargent*).—Plant medium, uniform, fairly erect, very slightly tinged; flower-buds drop; tubers many, rather small; skin rough, yellowish; eyes few, very shallow; eyebrows inconspicuous; flesh firm, white. 45 lb., slightly scabby. (Sussex seed.)

49, *122. Sharpe's Victor (Barr; *Sharpe*), **A.M.** August 14, 1900.—Plant uniform, fairly erect, coloured bronze purple; foliage small, smooth; flower mauve, with white tips to petals; tubers many, rather small; skin smooth, white; eyes few, shallow; eyebrows prominent; flesh fairly firm, yellow. 33 and 35 lb.; many chats. (Lincolnshire seed.)

* **These stocks were obtained for comparison.**

43, 44. Snowdrop Selected (Barr, Dobbie; *Perkins*).—Plant medium, uniform, erect, slightly tinged; foliage medium, smooth; eyes few, very shallow; eyebrows inconspicuous; flesh fairly firm, white. 37 and 49 lb., scabby. (Lincolnshire and West Lothian seed.)

4. Sweethope Early (*Scarlett*).—Plant small, uniform, spreading, mottled; foliage small, smooth, much curled; flowers very few; tubers very small; skin smooth, yellowish; eyes few, shallow; eyebrows prominent; flesh firm, yellow. 12 lb., all chats. (Midlothian seed.)

47. The Gadstock (*Gentle*).—Plant large, uniform, fairly erect, mottled purple-bronze; foliage medium, fairly smooth; flowers few, white; tubers many, small; skin rough, white; eyes few, fairly shallow; eyebrows prominent; flesh yellowish. 41 lb., scabby; many chats. (Hertfordshire seed.)

88. Toogood's Triumph (*Toogood*).—Plant medium, irregular, fairly erect, mottled; foliage medium, smooth; flowers mauve, tipped white; tubers many, rather small; skin smooth, yellow; eyes many, superficial; eyebrows prominent; flesh firm, yellow. 33 lb., slightly scabby. (Lincolnshire seed.)

22. Western Hero (*Veitch*).—Plant large, uniform, erect, slightly tinged; foliage large, fairly smooth; flower-buds drop; tubers many, regular, fairly large; skin smooth, white; eyes few, very shallow; eyebrows inconspicuous; flesh firm, yellowish. 52 lb.; slightly scabby, otherwise a good stock. (Devon seed.)

23, 24. Witchill Seedling (Barr, Dobbie; *Brown*), **F.C.C.** July 30, 1912.—Plant large, uniform, erect; foliage large, fairly smooth; flowers white; tubers regular, medium size; skin rough, yellowish; eyes rather many, fairly deep; eyebrows inconspicuous; flesh firm, creamy. 65 and 54 lb. (Scotch and West Lothian seed.)

(*b*) *Tubers Kidney, red.*

*123. Beauty of Hebron, **A.M.** August 14, 1900.—Plant medium, irregular, erect, light green, slightly tinged; foliage small, fairly smooth; flowers white; tubers rather small; skin rough; eyes few, deep; eyebrows prominent; flesh soft, tinged red. 16 lb., diseased and scabby; many chats.

50. Mr. Bresse (Dobbie).—Plant large, uniform, much branched, fairly erect, tinged grey bronze; foliage medium smooth; leaflets narrow; flower-buds drop; tubers many, large, skin smooth; eyes few, fairly shallow; eyebrows inconspicuous; flesh moderately firm, tinged red. 50 lb., very scabby. (West Lothian seed.)

(*c*) *Tubers Pebble, white or yellow.*

*118. Arduthie Seedling.—Plant large, uniform, fairly erect, tinged; foliage medium, smooth; buds drop; tubers fairly large;

* These stocks were obtained for comparison.

skin rough, yellowish; eyes few, deep; eyebrows inconspicuous; flesh fairly firm, yellow. 60½ lb., all ware; slightly scabby.

29. Carisbrooke Castle (*Sutton*).—Plant large, uniform, erect, deeply tinged; foliage large, slightly wrinkled, hairy; not flowering; tubers small; skin smooth, white; eyes many, mostly at apex, deep; eyebrows very prominent; flesh firm, yellow. 60 lb., a good crop of small tubers, but all ware; a little scabby. (Scotch seed.)

28. Dunnottar Castle (*Sutton*).—Plant large, uniform, erect; foliage large, smooth; petioles slightly tinged; flowers few, white; tubers many, fairly large; skin rough, white; eyes few, deep; eyebrows inconspicuous; flesh firm, white. 51 lb., very clean; many chats. (Scotch seed.)

124. Grosvenor Beauty (*Adams*).—Plant small, uniform, fairly erect; foliage small, wrinkled; flower-buds drop; tubers few, small; skin smooth, white; eyes few, fairly deep; flesh moderately firm, yellowish. 12 lb., clean. (Tunbridge Wells seed.)

48. Guardian (*Webb*).—Plant medium, irregular, fairly erect, slightly tinged; foliage medium, fairly smooth; flower-buds drop; tubers many, small; skin smooth, white; eyes few, deep; eyebrows inconspicuous; flesh soft, white. 24 lb., scabby, many chats. (Dumfries seed.)

57. Hero King (*Sim*).—Plant large, uniform, erect, slightly mottled; foliage medium, narrow, smooth; flower-buds drop; tubers irregular, large to small; skin smooth, white; eyes few, shallow; eyebrows prominent; flesh soft, yellow. 49 lb., scabby. (Aberdeenshire seed.)

5, 6. Midlothian Early (Sydenham, Dobbie; *Douglas*), **A.M.** July 31, 1908.—Plant large, uniform, erect, short jointed, mottled bronze; foliage medium, fairly smooth; flowers coloured; tubers many, fairly large, regular; skin yellowish; eyes few, shallow; eyebrows inconspicuous; flesh firm, yellowish. 36 and 59 lb., all ware, slightly scabby. (Lincolnshire and West Lothian seed.) Stock No. 5 was mixed.

30. Stretton No. 1 (*Miln*).—Plant medium, uniform, spreading; foliage large, smooth; not flowering; tubers, rather few, small; skin smooth, white; eyes many, fairly shallow; eyebrows inconspicuous; flesh firm, white. 32 lb., slightly scabby, many chats. (Cheshire seed.)

58. The Duchess (*Dobbie*).—Plant medium, uniform, fairly erect, slightly tinged; foliage small, fairly smooth; flowers tinged; tubers many, rather small, irregular; skin smooth, white; eyes few, mostly at apex, rather deep; eyebrows inconspicuous; flesh firm, white. 43 lb., scabby. (West Lothian seed.)

94. William Peters (*Peters*).—Plant very small, irregular, fairly erect; foliage medium, mostly wrinkled; flowers few, white; tubers few, of medium size, regular; skin rather rough, white; eyes few, shallow; eyebrows inconspicuous; flesh soft, white. 15 lb., scabby. (Leatherhead seed.)

(d) Tubers Pebble, red.

54. Cruden Conqueror (*Coutts*).—Plant medium, uniform, fairly erect, tinged purple brown; foliage medium, generally wrinkled; flowers coloured; tubers rather small, skin smooth; eyes many, shallow; eyebrows fairly conspicuous; flesh firm, tinged red. 33 lb. (Aberdeenshire seed.)

(e) Tubers Round, white or yellow.

35. Alpha (*Dobbie*), **A.M.** July 28, 1903.—Plant medium, weak, uniform, erect, tinged; foliage small, slightly wrinkled; flower absent; tubers round, of medium size; skin fairly smooth, white; eyes many, deep; eyebrows inconspicuous; flesh firm, white. 32 lb., many chats and some scabby. (West Lothian seed.)

*110. Centenary, **A.M.** September 11, 1910.—Plant large, uniform, erect, tinged; foliage medium, smooth; not flowering; tubers round, rather small; skin smooth, white; eyes rather many, deep; eyebrows prominent; flesh firm, white. 48 lb., many chats.

109. Cigarette (Barr; *Kerr*), **A.M.** November 21, 1905.—Plant large, uniform, erect, mottled; foliage medium, smooth; not flowering; tubers round, fairly large; skin rough, white; eyes few, deep; eyebrows inconspicuous; flesh firm, white. 53 lb., all ware. (Scotch seed.)

56. Dalmeny Early (Barr; *Rosebery*), **A.M.** September 13, 1910. —Plant medium, fairly uniform, mostly erect; foliage medium, wrinkled; flowers slightly tinged; tubers few, rather small; skin rough, white; eyes many, deep; eyebrows prominent; flesh firm, white. 22 lb., scabby. (Lincolnshire seed.)

16, 37. Duke of York (Dobbie, Simpson; *Daniels*), **A.M.** August 31, 1915.—Plant fairly large, uniform, spreading; foliage medium, fairly smooth, light green; flower-buds drop; tubers rather many, large, regular; skin rough, yellow; eyes few, shallow; eyebrows inconspicuous; flesh firm, yellow. 53 and 15 lb., slightly scabby. (Midlothian and Lincolnshire seed.)

60, *61. Epicure (Barr; *Sutton*), **A.M.** August 15, 1905.—Plant large, uniform, erect, tinged; foliage medium, smooth; flowers white; tubers fairly many, of medium size; skin smooth, white; eyes many, deep; eyebrows prominent; flesh firm, white. 44 and 20 lb., scabby. (Scotch seed.) No. 61 was not such a good stock.

104. Five Mile Town (*Carter*).—Plant small, irregular, fairly erect; foliage small, wrinkled; flowers white; tubers few, of medium size; skin smooth, white; eyes many, deep; eyebrows prominent; flesh firm, white. 16 lb. (Hertfordshire seed.)

113. Irish King (*Barr*), **A.M.** August 26, 1913.—Plant small and weak; tubers few, of medium size; skin rough, yellow; eyes few, shallow; eyebrows inconspicuous; flesh soft, faintly yellow. 10 lb., all chats. (Taplow seed.)

125. Long Set (*Lawrie*).—Plant large, uniform, erect, mottled;

*** These stocks were obtained for comparison.**

foliage medium, fairly smooth; flowers white; tubers rather small; skin smooth, white; eyes few, rather deep; flesh firm, white. 38 lb. (Scotch seed.)

*119. Midsummer Early (Dobbie).—Plant medium, erect, tinged; foliage small, wrinkled; not flowering; tubers fairly large, regular; skin rough, white; eyes few, large, deep; eyebrows prominent; flesh fairly firm, yellowish. 39 lb. (Auchtermuchty seed.)

33, 34. Milecross Early (Dobbie, Dickson; *Dickson*).—Plant large, uniform, very erect, tinged grey purple; foliage small, wrinkled; not flowering; tubers few, rather small; skin rough, white; eyes few, rather deep; eyebrows prominent; flesh firm, white. 21 and 11 lb., slightly diseased. (Midlothian and Newtownards seed.)

91. Money Maker (*Williams*).—Plant large, uniform, fairly erect, tinged; foliage medium smooth; flowers white; tubers many, fairly large, regular; skin smooth, white; eyes many, shallow; eyebrows prominent; flesh firm, white. 59 lb., all ware; a very good stock. (Carnarvon seed.)

*111. Russet Queen, **A.M.** October 23, 1906.—Plants medium, irregular, tinged purple bronze; foliage medium, smooth; flowers white; tubers rather many, small to large; skin smooth, white; eyes few, fairly shallow; eyebrows prominent; flesh moderately firm, white. 24 lb., diseased.

64. The Chiltern (*Gentle*).—Plant small, irregular, fairly erect, mottled; foliage small, wrinkled; flowers few, pale; tubers few, small, regular; skin smooth, white; eyes few, fairly shallow; eyebrows inconspicuous; flesh firm, yellowish. 23 lb., scabby. (Hertfordshire seed.)

II. Second-Early Varieties.

(*a*) *Tubers Kidney, white or yellow.*

*10. Ashleaf Selected.—Plant medium, uniform, erect, short jointed; foliage medium, wrinkled; flowers coloured; tubers many, fairly large; skin smooth, white; eyes fairly deep; eyebrows prominent; flesh firm, yellow. 42 lb., some disease.

*86. Brydon's Crampton **A.M.** October 23, 1906.—Plant large, uniform, fairly erect, tinged; foliage medium, mostly wrinkled; tubers irregular, large to small; skin fairly smooth, yellow; eyes rather many, fairly shallow; eyebrows prominent; flesh firm, white. 71 lb.

106. Carter's Goldfinder (*Carter*).—Plant medium, uniform, fairly erect, tinged; foliage small, wrinkled; tubers many, fairly large; skin smooth, white; eyes few, rather deep; eyebrows inconspicuous; flesh soft, white. 55 lb. (Scotch seed.)

92. Chieftain (*Webb*).—Plant small, irregular, erect, slightly tinged; foliage medium, fairly smooth; flowers coloured; tubers medium size, regular; skin smooth, white; eyes few, shallow; eyebrows inconspicuous; flesh soft, cream. 28 lb., slightly scabby. (Dumfries seed.)

* These stocks were obtained for comparison.

59. Edinburgh Castle (*Sutton*).—Plant large, uniform, erect, slightly tinged reddish bronze; foliage medium, mostly wrinkled; tubers many of medium size; skin smooth, yellow; eyes few, fairly shallow; eyebrows inconspicuous; flesh firm, white. 56 lb. (Scotch seed.)

18, 20. Express (Webb, Simpson).—See 'Sharpe's Express.' 35 and 36 lb., slightly scabby. (Dumfries and Lincolnshire seed.)

11. Gladiator (*Sutton*).—Plant fairly large, uniform, erect, long jointed, tinged bronze; foliage large, fairly smooth; flower-buds drop before opening; tubers many, fairly large; skin rather rough, white; eyes few, shallow; eyebrows inconspicuous; flesh firm, yellowish. 62 lb. (Scotch seed.)

45. Hawlmark Express (*Dickson*).—Plant medium, uniform, erect, slightly tinged; foliage small, fairly smooth; flower-buds drop; tubers fairly large; skin smooth, white; eyes few, shallow; eyebrows prominent; flesh soft, yellow. 42 lb., scabby. (Newtownards seed.)

8. Myatt's Prolific Ashleaf (Sydenham).
7. Old Yellow Ashleaf (Stark), **A.M.** August 31, 1915. } Syn.—
Plant large, fairly uniform, erect, short jointed, spotted bronze; foliage medium, wrinkled; petioles tinged bronze; flowers purple; tubers many of medium size; skin smooth, yellow; eyes few, shallow; eyebrows prominent; flesh soft, white. 41 and 38 lb. (Lincolnshire seed.) No. 8 was not such a good stock.

17, 19. Sharpe's Express (Barr, Dobbie; *Sharpe*), **A.M.** August 13, 1901.—Plant large, uniform, erect, slightly tinged; foliage small, wrinkled; flower-buds drop; tubers many, rather small; skin smooth, white; eyes few, rather deep; eyebrows inconspicuous; flesh firm, creamy. 66 and 65 lb., slightly diseased. (Lincolnshire and Midlothian seed.)

12, 13, 36. Sir John Llewelyn (Barr, Dobbie, Simpson; *Harris*), **A.M.** September 11, 1900.—Plant large, uniform, erect, tinged; foliage large, fairly smooth; flowers white; tubers many, regular, of medium size; skin smooth, white; eyes few, fairly shallow; eyebrows inconspicuous; flesh firm, creamy white. 31, 63, and 19 lb. (Scotch, West Lothian, and Lincolnshire seed.) Stock No. 36 was very irregular.

41. Stretton No. 4 (*Miln*).—Plant medium, uniform, erect; foliage small, wrinkled; flower-buds drop; tubers rather many, small; skin rather rough, yellow; eyes few, of moderate depth; eyebrows inconspicuous; flesh firm, white. 33 lb., stock very uniform. (Cheshire seed.)

40. Stretton No. 7 (*Miln*).—Plant medium, uniform, rather spreading, tinged dull purple; foliage medium, fairly smooth; flowers white; tubers irregular, of medium size; eyes many, rather deep; eyebrows very prominent; flesh firm, white. 44 lb.; scabby. (Cheshire seed.)

87. Stretton No. 9 (*Miln*).—Plant large, not very uniform, erect,

tinged; foliage large, mostly smooth, leaflets narrow; flowers coloured; tubers many, regular, of medium size; skin rather rough, yellow; eyes few, fairly shallow; eyebrows rather prominent; flesh firm, white. 79 lb. (Cheshire seed.)

*85. Supreme, **A.M.** September 11, 1900.—Plant medium, uniform, erect, coloured, yellow brown; foliage medium, fairly smooth; flower-buds drop; tubers fairly many, large; skin very smooth, white; eyes few, very shallow; eyebrows inconspicuous; flesh firm, white. 58 lb., diseased.

46. The Prizewinner (*Sargent*).—Plant small, irregular, erect, mottled purple; foliage medium, wrinkled, very pubescent; flower-buds drop; tubers fairly large, regular; skin rough, white; eyes few, shallow; eyebrows inconspicuous; flesh firm, creamy. 25 lb., very scabby. (Merstham seed.)

(*b*) *Tubers Kidney, red or purple.*

53. Bogbrae Black Watch (*Coutts*).—Plant medium, irregular, erect, coloured; foliage medium, wrinkled; not flowering; tubers irregular, mostly small; skin smooth, red; eyes few, rather deep; eyebrows prominent; flesh soft, white. 20 lb. (Aberdeen seed.)

52. Bogbrae Dreadnought (*Coutts*).—Plant medium, uniform, erect, coloured purplish; foliage medium, wrinkled; flowers white; tubers few, medium size; skin fairly smooth, deep dull purple; eyes fairly numerous, very deep; eyebrows very prominent; flesh firm, white streaked round eyes. 30 lb. (Aberdeen seed.)

55. Bogbrae Gordon Highlander (*Coutts*).—Identical with 'Bogbrae Dreadnought,' except that tubers have slightly deeper eyes. 28 lb. (Aberdeen seed.)

51. Exhibition Red Kidney (*Dobbie*).—Plant medium, not very uniform, erect, coloured purple; foliage medium, wrinkled; flowers pale purple; tubers fairly many, fairly large; skin very smooth, red; eyes few, very shallow; eyebrows inconspicuous; flesh moderately firm, white, streaked red. 34 lb., diseased. (West Lothian seed.)

(*c*) *Tubers Pebble, white or yellow.*

27. Best of All (*Williams*).—Plant large, uniform, much branched, erect, tinged bronze; foliage medium, fairly smooth; flowers freely white; tubers many, fairly large; skin rough, yellow eyes many, very deep; eyebrows prominent; flesh firm, white. 67 lb., a little scab. (Carnarvon seed.)

(*d*) *Tubers Pebble, red or purple.*

31. General Joffre (*Sands*), **XX** August 31, 1915.—Plant large, uniform, erect, rather spindly; foliage small, wrinkled, pubescent; flowers deep blue; tubers fairly many, fairly large; skin smooth, purple; eyes few, mostly at apex, deep; eyebrows inconspicuous; flesh fairly firm, white. 41 lb., clean stock. (Irish seed.)

* These stocks were obtained for comparison.

(e) *Tubers Round, white or yellow.*

105. Goldfinder (*Webb*).—Plant large, irregular, erect, tinged; foliage medium, fairly smooth; flowers white; tubers many, of medium size; skin fairly smooth, white; eyes few, shallow; eyebrows inconspicuous; flesh firm, white. 51 lb., very slightly diseased. (Worcestershire seed.)

*39. Harbinger, **A.M.** August 5, 1897.—Plant medium, uniform, erect; slightly tinged; foliage small, wrinkled; flower-buds drop; tubers of medium size, regular; skin fairly rough, yellow; eyes few, shallow; eyebrows inconspicuous; flesh firm, white. 43 lb., slightly diseased, but very pure stock.

73. King George V. (Simpson; *Marsh*), **A.M.** July 30, 1912.—Plant medium, uniform, fairly erect, tinged; foliage medium, wrinkled; flowers coloured; tubers few, of medium size; skin rough, white; eyes few, shallow; eyebrows inconspicuous; flesh streaked. 41 lb. Some disease. Stock not quite true. (Lincolnshire seed.)

42. Purple Eyes (Dobbie).—Plant medium, uniform, erect; foliage small, mostly wrinkled; not flowering; tubers few, large to small; skin fairly smooth, white; eyes purple; eyebrows very inconspicuous; flesh soft, white. 26 lb. (West Lothian seed.)

63. Regina (*Scarlett*).—Plant large, uniform, fairly erect, tinged; foliage medium, smooth; flowers white; tubers many, rather small; skin smooth, white; eyes fairly numerous, deep; eyebrows prominent; flesh firm, white. 56 lb., a pure, uniform, stock. (East Lothian seed.)

107. Scarlett's Top (*Scarlett*).—Plant medium, fairly erect, irregular, slightly tinged; foliage mostly very large, smooth; flowers coloured; tubers few, regular, fairly large; skin fairly smooth, white; eyes few, moderately deep; eyebrows prominent. 37 lb. (Fifeshire seed.)

112. Scottish Chief (*Barr*).—Plant large, uniform, erect, tinged; foliage medium, smooth; flowers coloured; tubers many, irregular, rather small; skin smooth, white; eyes few, shallow; eyebrows inconspicuous; flesh soft, white. 54 lb. (Scotch seed.)

38. The Colleen (Barr; *Williamson*), **A.M.** August 9, 1907.—Plant small, uniform, erect, tinged purple bronze; foliage small, fairly smooth; flowers white; tubers fairly many, fairly large; skin smooth, white; eyes many, deep; eyebrows very prominent; flesh firm, creamy. 33 lb., slightly diseased, scabby. (Lincolnshire seed.)

(f) *Tubers Round, red or purple.*

83. Climax (Dobbie).—Plant large, uniform, scanty, erect; foliage medium, mostly wrinkled; petioles coloured; flowers coloured; tubers fairly numerous, fairly large; skin rough, pink,

* These stocks were obtained for comparison.

white blotched; eyes few, shallow; eyebrows inconspicuous; flesh soft, deep yellow. 49 lb., slightly diseased.

84. Eighty-fold (Dobbie; *Findlay*).—Plant large, irregular, fairly erect, deeply tinged; foliage medium, fairly smooth; flowers coloured; tubers few, fairly large; skin rough, purple; eyes few, deep; eyebrows prominent; flesh white. 46 lb., diseased. (West Lothian seed.)

III. Mid-season Varieties.

(*a*) *Tubers Kidney, white or yellow.*

117. King Edward VII. (Simpson; *Butler*).—Plant large, irregular, erect, tinged pale bronze; foliage large, smooth; tubers many, irregular, mostly small; skin smooth, white, blotched red round the eyes; eyes few, very shallow; eyebrows very prominent; flesh firm, pale yellow. 47 lb. (Lincolnshire seed.)

93. Sir Edward Carson (*Sands*).—Plant large, uniform, erect, sub-laterals spreading; foliage medium, smooth; flowers white; tubers fairly many, of medium size; skin smooth, white; eyes few, rather deep; eyebrows prominent; flesh soft, white. 71 lb., good stock. (Irish seed.)

95. Stretton No. 20 (*Miln*), **A.M.** August 31, 1915.—Plant large, fairly uniform, erect, tinged in bands on internodes; foliage large, smooth; flowers coloured; tubers many, of medium size, regular; skin smooth, white; eyes few, shallow; eyebrows inconspicuous; flesh soft, cream. 70 lb. (Forfarshire seed.)

89. White City (Veitch).—Plant medium, uniform, erect, tinged; foliage large, wrinkled; flowers coloured; tubers fairly numerous, of medium size; skin smooth, yellow; eyes fairly numerous, fairly shallow; eyebrows prominent; flesh firm, cream. 43 lb.; good stock. (Exeter seed.)

(*c*) *Tubers Pebble, white.*

67. Conquest (Dobbie; *Findlay*).—Plant large, uniform, fairly erect; foliage medium; fairly smooth; flowers white; tubers many, large to small; skin rough, white; eyes deep, especially at apex; eyebrows prominent; flesh firm, white. 51 lb., slightly diseased and scabby. (West Lothian seed.)

96. Stretton No. 6 (*Miln*).—Plant medium, irregular, erect, mottled purple-bronze; foliage medium, smooth; flowers white; tubers many, regular, of medium size; skin rough, white; eyes medium number and depth; eyebrows prominent; flesh soft, white. 39 lb. (Forfarshire seed.)

(*e*) *Tubers Round, white or yellow.*

66. Acquisition (*Sutton*).—Plant large, uniform, fairly erect, mottled; foliage fairly large, smooth; flowers white; tubers regular,

large; skin smooth, white; eyes few, deep, especially at apex; eyebrows fairly prominent; flesh slightly tinged cream. 62 lb.; diseased and scabby. (Scotch seed.)

68. Arran Beauty (Dobbie; *McKelvie*).—Plant large, uniform, erect, tinged; foliage large and small, wrinkled; flowers coloured; tubers many, fairly large, regular; skin rough, white; eyes few, of medium depth; eyebrows prominent; flesh, firm, white. 66 lb. (Ayrshire seed.) This variety is almost identical with No. 69, 'British Queen.'

101. Arran Chief (Veitch; *McAlister*), **A.M.** August 31, 1915.—Plant large, uniform, erect, mottled; foliage medium, smooth; flower-buds drop; tubers many, fairly large, notched; skin smooth, white; eyes few, shallow, except at apex; eyebrows inconspicuous; flesh firm, white. 70 lb.; good, clean, stock. (Devon seed.)

100. Balmoral Castle (*Sutton*).—Plant large, uniform, erect, pallid; foliage medium, smooth; flowers coloured; tubers many, irregular, large to small; skin rough, yellow; eyes fairly numerous, deep; eyebrows inconspicuous; flesh soft, yellow. 71 lb.; good, clean, stock. (Scotch seed.)

69, 70. British Queen (Barr, Dobbie; *Findlay*), **A.M.** August 15, 1905.—Plant medium, uniform, fairly erect, slightly tinged; foliage medium, fairly smooth; flowers white; tubers many, fairly large, regular; skin rough, white; eyes few, of medium depth; eyebrows prominent; flesh firm, white. 59 and 69 lb.; good, pure stock. (Lincolnshire and West Lothian seed.) See No. 68, 'Arran Beauty.'

98. Darlington (*Kent and Brydon*).—Plant large, uniform, erect, mottled light green; foliage medium, smooth; flowers white; tubers many, rather small, regular; skin rough, white; eyes few, shallow; eyebrows inconspicuous; flesh white, streaked. 55 lb., clean.

74. Favourite (*Dobbie*), **F.C.C.** December 31, 1907.—Plant very large, uniform, branched, erect, mottled; foliage large, smooth; flowers white; tubers many, large, notched, irregular; skin rough, white; eyes few, of medium depth; eyebrows rather prominent; flesh firm, tinged cream. 61 lb.; slightly diseased. (West Lothian seed.)

71, 72. Great Scot (Veitch, Dobbie; *McAlister*), **A.M.** September 26, 1911.—Plant large, uniform, erect, slightly tinged; foliage medium, fairly smooth; tubers many, fairly large, flat, regular; skin rather rough, white; eyes few, large, very deep; eyebrows fairly shallow; flesh firm, cream. 65 and 75 lb. (Exeter and West Lothian seed.)

102. Mainstay (*Carter*).—Plant medium, uniform, erect; foliage medium, fairly smooth; flowers white; tubers many, of medium size, regular; skin smooth, white; eyes few, shallow; eyebrows inconspicuous; flesh firm, white. 45 lb. (Hertfordshire seed.)

108. Pride of Scotland (Smith; *Cruickshank*).—Plant large, irregular, erect, mottled above leaf-axil; foliage medium, smooth; flowers white; tubers many, rather small, notched; skin smooth,

white; eyes few, deep; eyebrows inconspicuous; flesh firm, white. 59 lb. (Banffshire seed.)

99. Punta Arenas (Dobbie).—Plant very large, irregular, erect, tinged; foliage medium, smooth, glossy; flowers white; tubers many, rather small, regular; skin rough, white; eyes few, shallow; eyebrows inconspicuous; flesh soft, white. 41 lb. (West Lothian seed.)

103. Raynes Park White (*Carter*).—Plant medium, uniform, erect, slightly mottled; foliage medium, smooth, glossy; flowers white; tubers fairly large, regular; skin smooth, white; eyes few, deep; eyebrows prominent; flesh firm, white. 70 lb.; slight disease. (Scotch seed.)

65. Southampton Wonder (*Toogood*).—Plant medium, uniform, erect, mottled bronze; foliage medium, fairly smooth; flower-buds drop; tubers many of medium size; skin smooth, white; eyes few, deep, especially at apex; eyebrows inconspicuous; flesh firm, white. 52 lb. scabby. (Scotch seed.)

79. Stirling Castle (*Sutton*), **A.M.** August 31, 1915.—Plant large, uniform, erect, tinged grey and bronze; foliage medium, mostly wrinkled; flower-buds drop; tubers many, fairly large, regular; skin rough, white; eyes few, shallow; eyebrows inconspicuous; flesh firm, white. 72 lb.; good, clean stock. (Scotch seed.)

80. Stretton No. 5 (*Miln*).—Plant large, fairly uniform, erect, very faintly tinged; foliage small, smooth; flower-buds drop; tubers many, fairly large, notched regular; skin rough, white; eyes fairly numerous, of moderate depth; eyebrows inconspicuous; flesh fairly firm, white. 58 lb., some disease. (Cheshire seed.)

114. Stretton No. 21 (*Miln*).—Plant large, uniform, erect, mottled purple; foliage large, smooth; flowers white; tubers many, large to small; skin smooth, white; eyes few, of medium depth; eyebrows inconspicuous; flesh white, soft. 61 lb.; very vigorous stock. (Forfarshire seed.)

81. Auquharney Roundhead (*Coutts*).—Plant medium, uniform, erect, tinged; foliage medium, wrinkled; leaflets narrow; flowers purple; tubers many, large to small; skin smooth, white; eyes many, deep; eyebrows prominent; flesh soft, yellow. 45 lb. (Aberdeenshire seed.)

97. Tremendous (*Toogood*), **A.M.** September 26, 1911.—Plant medium, uniform, fairly erect, slightly tinged; foliage medium, smooth; flowers coloured; tubers of medium size, regular; skin smooth, white; eyes few, shallow; eyebrows inconspicuous; flesh soft, white. 45 lb.; very clean, good tubers. (Scotch seed.)

78. Warwick Castle (*Sutton*).—Plant large, uniform, erect, tinged grey bronze; foliage medium, mostly wrinkled; flower-buds drop; tubers many, of medium size, regular; skin fairly smooth, white; eyes few, of medium depth; eyebrows inconspicuous; flesh firm; white. 66 lb., good stock. (Scotch seed.)

76, 77. Windsor Castle (Barr, Dobbie; *Sutton*), **F.C.C.** September 12,

1893.—Plant large, fairly uniform, erect, tinged; foliage medium, fairly smooth; terminal leaflet broad; flower-buds drop; tubers many, fairly large, regular; skin smooth, white; eyes few, large, deep; eyebrows prominent; flesh soft, white. 48 and 77 lb.; good, vigorous stocks, some chats. (Scotch and West Lothian seed.)

75. Wolfe's Secundus (Dobbie; *Wolfe*), **A.M.** August 31, 1915. Plant large, uniform, erect, mottled; foliage large, smooth; flowers white; tubers many, fairly large, regular; skin smooth, white; eyes few, shallow; eyebrows fairly prominent; flesh firm, white. 55 lb.; very slightly diseased. (West Lothian seed.)

(*f*) *Tubers Round, red or purple.*

82. Mauve Queen (*Dobbie*).—Plant small, scanty, fairly uniform, fairly erect, tinged; foliage medium, narrow, mostly wrinkled; flowers white; tubers few, medium size, regular; skin rough purple; eyes few, fairly shallow; eyebrows inconspicuous; flesh white, streaked in vascular cylinder. 23 lb. (West Lothian seed.)

115. Stretton No. 2 (*Miln*).—Plant large, uniform, erect, mottled at node; foliage large, smooth; flowers white; tubers many, fairly large; skin deep purple; eyes rather many, deep; eyebrows prominent; flesh soft, white, streaked purple. 55 lb. (Cheshire seed.)

116. Stretton No. 3 (*Miln*).—Plant large, uniform, erect, mottled; foliage large, smooth; flowers white; tubers many, rather small; skin red; eyes few, shallow; eyebrows inconspicuous; flesh white. 62 lb.; very clean. (Cheshire seed.)

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXIX.—Report on Experiments with Bacterized Peat or Humogen.

By F. J. Chittenden, F.L.S.

In the late autumn of 1913 the Council requested me to carry out some tests of Professor Bottomley's bacterized peat in order to see how far the claims which had been put forward with regard to it were justified. The following is an account of these tests.

A.—Nature of the Peat.

The term peat as used by the gardener in reference to material employed in making potting composts is a generic one, but it does not as a rule connote the peat from which the material under trial is prepared. This raw material is peat-moss litter as sold for bedding horses in stables, and consists almost entirely of dried Sphagnum, altered somewhat through its submergence in bog water, and a certain amount of fibre derived probably from heaths and similar plants which grow on the surface of sphagnum bogs. It is not in its raw state used in gardening operations except to a very limited extent. It consists almost entirely of organic matter, the ash in the dry peat being only 1·37 per cent. It is brown in colour, and a water extract is decidedly acid in reaction. Its most characteristic property is its relatively enormous absorptive capacity, which has led to its use as an absorbent of urine in stables and in a more recent state in the making of molascuit and similar cattle foods, and in making surgical bandages. Its chemical composition is undoubtedly very complex, and it apparently contains some organic compound which is to some extent detrimental to the growth of ordinary plants, though this bad effect is not always very noticeable, as will be seen.

Professor Bottomley tells us that this complex raw material is treated in three stages in order to produce the bacterized peat. " First, the raw peat is moistened with a culture solution of the special 'humating' bacteria, and the mass kept at a constant temperature for a week or ten days; during this time the bacteria act on certain organic constituents of the peat, and gradually convert a large amount of the humic acid present into soluble humates; second, the humating bacteria, having done their work, are destroyed by sterilizing the peat by live steam; third, the sterilized peat is treated with a mixed culture of nitrogen-fixing organisms—*Azotobacter chroococcum* and

Bacillus radicicola—and after a few days' incubation at 20 degrees C. is ready for use." *

Professor BOTTOMLEY's theory appears to be that the humifying bacteria produce soluble humates upon which the nitrogen-fixers thrive, but we are left in the dark as to many things connected with the preparation of the material, and, as a consequence, experiments with it are bound to be very largely empirical in their nature. Analyses have been published by Professor BOTTOMLEY † showing an increase in the nitrogen content from about 1·267 per cent. in the raw peat to about 4·31 per cent. in the finished product, and it is difficult to believe that so great an amount of nitrogen as is represented by a difference of over 3 per cent. should be taken from the air and fixed in the course of "a few days." The probable explanation of these figures is that the material had been under cultivation for much more than "a few days" before the analysis was made. There is no theoretical reason why the fixation of nitrogen should not go on for a long time in such material if the moisture content and the temperature are suitable.

Another point of importance arises from the fact that we have no knowledge whatever of the price at which the bacterized peat can be sold, and this prevents any proper comparison with other manures on the market.

B.—Claims made for the Peat.

The chief claim made for the bacterized peat is that it greatly stimulates growth. Minor claims are that root growth is particularly encouraged, and that the root-knot eelworm, which is so troublesome an enemy of pot plants, does not attack plants treated with this peat. We have no evidence upon the last point, and have had no opportunity of testing it ; the conclusions we have come to with regard to the other two are set out below.

C.—Material used in Tests.

At our request Professor BOTTOMLEY was good enough to send us a supply of his treated peat, which reached us at the beginning of January 1914. He did not at that time send us any of the raw peat, and for comparative purposes we purchased some peat-moss litter, which we used in all the pot experiment controls and in some of the experiments in the open. Later a supply of the raw peat was also received from Professor BOTTOMLEY and was used in some cases. Except that it appeared to be a little more solid than the sample we had been using, it was apparently precisely like it.

The bacterized peat was unfortunately not the same in all the experiments. Four consignments were sent by Professor BOTTOMLEY in all, and there was a marked difference in appearance between the

* BOTTOMLEY, W. B., "The Bacterial Treatment of Peat," *Jour. Roy. Soc. Arts*, vol. lxii. (1914), p. 374.

† *L.c. ante.*

first, which was used in all the pot experiments (referred to as Series 1 below), and the next two, which were used in the experiments in the open (Series 2 and 3 below). The first was rather brown in colour, contained a considerable quantity of water (over 60 per cent.), and was of rather rough texture; *i.e.* the pieces of which it was composed varied a great deal in size. The next two were almost black, contained less moisture, and had apparently been riddled before being sent out; on this account it was much easier to sow evenly on the ground than the first lot would have been. It is scarcely to be doubted that the difference in colour denoted a difference in chemical composition, and it is probable the drying process may have brought about some difference in composition too. Water extracts of both forms gave a decidedly acid reaction. The last (used in Series 4 and 5 below) received in 1915 was browner than these. No analysis of any of the samples was made.

It seems apparent that Professor BOTTOMLEY is still experimenting with the material, and has not yet settled upon a fixed product or a fixed method of preparing it, so that whatever conclusions are drawn from the results of the following experiments can apply only to the particular samples used, and are not of general application. It is to be regretted that we were unable to use the same quality of bacterized peat in all the experiments, as the results of the different series are not now directly comparable with one another, and more especially as one point of considerable interest in such a trying season as that of 1914 is involved, *viz.*, the part played by water in rendering available the constituents of the treated peat.

D.—Design of the Experiments.

It seemed desirable to ascertain as far as possible whether the alleged acceleration of growth was due to:

1. The water-holding capacity of the peat, or
2. The salts, and especially the nitrogen it contained, or
3. The action of hypothetical accessory "food-bodies," which may be called activators.

The last point may be dismissed in a few words. None of the experiments gave any evidence for or against the theory of the presence of such bodies, and comparative experiments carried out in soil are unlikely to do so, for the following reasons. If the same amount of nitrogen is added in farmyard manure or in other organic mixtures, it is not at all clear that the hypothetical accessory food bodies will not also be added. If it be added in the form of nitrate of soda or other salt, this may well cause chemical changes to occur in the organic constituents of the soil and lead to the formation of these accessory bodies (assuming such to exist). Too little of the subtle chemistry of the soil is known for it to be safe to theorize concerning these bodies from the evidence obtained from experiments such as those to be detailed immediately.

E.—Experiments made in 1914.

I. Series 1*a.*—Experiments in Pots with Ordinary Loam under Glass.

The plants chosen for this experiment were *Primula malacoides*, *Begonia semperflorens*, *Eupatorium adenophorum*, and tomato.

Primula malacoides.—A series of cultures was started with this plant, but it soon became evident that there was great individual variation between the plants in their characters and especially in their rates of growth. Further consideration of this set was therefore abandoned.

Begonia semperflorens.—A series of seedling plants of this species of equal size and age, and from the same batch of seedlings, was taken. They were potted as follows :—

No. of Plants.	Compost.		
	Loam.	Bacterized Peat.	Raw Peat.
	Parts.	Parts.	Parts.
4	7/8	1/8	—
4	3/4	1/4	—
4	1/2	1/2	—
4	1	—	—
4	3/4	—	1/4

A considerable difference was to be seen between the plants within a week or ten days of potting, and this difference became more marked as time passed. The larger quantities of peat had, however, little more effect than the smaller, while the only noticeable difference between the set in ordinary loam and that in loam and raw peat was a tendency in the latter to burn at the leaf margins. The plants in loam and bacterized peat were all of a much deeper green, had larger leaves, became considerably taller, and showed a much greater tendency to branch from the base than the control plants.

Eupatorium adenophorum.—A series of seedlings of this plant of equal size and age was potted up on the same day (January 12) and in similar composts to the foregoing. This is a particularly good plant for such experiments, as it is remarkably uniform in growth, and grows quickly, at the dull season of the year, in an ordinary greenhouse. The four plants in each set were very uniform in their behaviour, and all those in soil to which bacterized peat had been added grew considerably taller than those in loam, were darker green in the foliage except at the margins of the leaves which were of a lighter shade, more succulent looking, and much more copiously branched. Those in the compost of raw peat and loam were somewhat taller than those in the loam alone, and showed in a much slighter degree the same characters as those just referred to. The luxuriance of growth of those in the treated peat compost was very marked. Measurements were made of the leaves of all the plants on February 19, before there

was much difference in their height. The results are given below. Only the four pairs of leaves which had been last produced since their repotting were measured and their areas calculated.

Compost.	Plant.	Area of last eight leaves.	Total of four plants.
		Sq. cm.	Sq. cm.
Loam, 7/8; Bacterized peat, 1/8	1	314·3	1163·2
	2	228·3	
	3	317·8	
	4	302·8	
Loam, 3/4; Bacterized peat, 1/4	1	258·7	1132·9
	2	256·9	
	3	411	
	4	206·3	
Loam, 1/2; Bacterized peat, 1/2	1	334·9	1181·6
	2	302·3	
	3	258·3	
	4	286·1	
Loam only	1	242·7	701·1
	2	146·9	
	3	175·9	
	4	135·6	
Loam, 3/4; Raw peat, 1/4	1	127·1	737·5
	2	233·8	
	3	231·8	
	4	144·8	

Tomato.—Twenty seedling tomatos were potted up into large 60's in ordinary potting soil, twenty of the same size and age in soil to which one part in eight of ordinary peat had been added, and the same number in soil to which one part of bacterized peat in eight had been added. These were grown on for some weeks and their behaviour watched. The plants in the soil to which the bacterized peat had been added grew much more quickly than did those in the ordinary soil, or those in the soil to which untreated peat had been added; their leaves were much darker and much larger. There was little difference between those in the soil containing untreated peat and those in ordinary soil.

It might have been expected that the luxuriant growth would have caused considerable delay in flower-production, but this was not so. In fact the first flowers were produced by the plants in the mixture of soil and treated peat, and they were borne but little higher up the stem than were those on the plants in ordinary soil.

No attempt was made to estimate the cropping capacities of the respective sets, as the accommodation available was insufficient to permit of a sufficiently large number being grown on to get an accurate estimate of the fruiting power of the plants.

General Remarks.—In all these experiments the use of bacterized peat resulted in greatly increased growth, in the production of larger

leaves of a much darker green, in all, except the tomatos, a copious branching, and in no case was any delay in flower-production to be seen. It has been stated that the root-system was markedly influenced in the experiments made in some other places, but examination of the roots of several of the plants grown in this series showed nothing more in this direction than was to be expected if the larger foliage was to be sufficiently supplied with water.

A comparison of the growth of plants in soil and bacterized peat, and that in soil and untreated peat, shows that the water-retaining power of the peat is not sufficient to account for the differences in growth of plants in soil containing bacterized peat and in loam, respectively.

A somewhat remarkable thing is the comparatively slight difference in growth observed with the varying quantities of peat, for little extra growth and no detrimental effect were to be observed when the amount of bacterized peat reached half the content of the pot. If anything in these experiments lends support to the theory of the presence of "activators" it is this curious result.

II. Series 1b.—Experiments on Plants growing in Sand and watered with Peat extract.

The plants used in this series of experiments were tomatos.

Sixty seedling plants of the same size and age were planted in washed silver-sand in 60-sized pots. These plants were divided into five sets as follows :—

12 watered with a water extract of bacterized peat.
12 with a water extract of boiled peat.
12 with a water extract of untreated peat.
12 with an ammoniacal-water extract of untreated peat.
12 with water alone.

The plants were watered with the extract in question once a week, plain water being used at other times as required. Tap water was used in every case.

The plants watered with the ammoniacal extract all died within two days. A few of each of the other sets died from time to time, but a sufficient number of each survived to enable us to see the result of the treatment.

None of the plants grew really well, but those watered with the extract of bacterized peat much out-distanced the others. The leaves in these plants attained a length of three inches, while in none of the others was there any exceeding about one and a half inch after five weeks' growth. There was practically no difference between the plants watered with either of the other peat extracts and those watered with tap water.

It seems obvious from the results of this series of experiments that the value of the peat lies in the water-soluble contents after treatment, and that mere heating does not bring about the change necessary to give it this value.

III. Series 2.—Experiments in the Open in ordinary Garden Soil.

The plants chosen for this series of experiments were radishes, turnips, and French beans.

Radishes.—The site of this experiment was the fruit-experiment field. The soil is very sandy, but even in the driest weather, provided it is kept loose at the surface, retains sufficient moisture to keep plants growing and to appear moist at a depth of about three inches. It dries very quickly at the surface, however, so that seeds are apt to lie some time without germinating unless they are watered. Water was therefore applied three or four times until the plants had attained their first rough leaves.

The ground was divided into three plots, each twelve feet square, called Plot A, Plot B, and Plot C, respectively.

Plot A was dressed with bacterized peat at the rate of two tons to the acre,* the peat being distributed over the surface and hoed in.

Plot B received no peat or other manure.

Plot C received a dressing of untreated peat at the same rate and hoed in in the same way.

This land had received no manure since 1910, and had been growing plum stocks up to the spring preceding the sowing. The variety of radish called 'French Breakfast' was sown, twenty grams being sown on each plot. The seed was protected from birds by placing broom branches on the beds, and they were watered at intervals for a few days as noted above.

The seed was sown on May 20, and the plants were all removed and weighed on July 9. No difference was to be seen in the growth of the plants on the respective plots, nor was there any difference in the rate of germination.

The following table shows the weights from the several plots:—

	Number of Plants.	Gross weight.			Average weight.		
		Tops.	Roots.	Total.	Tops.	Roots.	Total.
		Grms.	Grms.	Grms.	Grms.	Grms.	Grms.
Plot A Bacterized peat .	276	2590	3420	6010	9·4	12·3	21·7
Plot B No dressing . .	318	2710	4220	6930	8·5	13·2	21·7
Plot C Untreated peat .	324	2755	3875	6630	8·5	12	20·5

* Two tons of peat to the acre is, of course, in no way comparable with even the smallest addition of peat used in the flower-pot experiments, viz. one in eight of the compost. To have used it at the same rate would have meant the addition of the treated peat at the rate of about 700 tons to the acre! This is, of course, altogether out of the bounds of practical horticulture. Prof. BOTTOMLEY suggested to us that from 1 ton to 2 tons to the acre would be a sufficient dressing, and in a book published since this Report was in type, and issued with the authority of Prof. BOTTOMLEY, a dressing of only ½ ton when used outdoors is recommended, presumably as a result of further experience, while 1 part of peat to 10 (or 20 in the case of bulbous plants) of soil is considered the proper quantity for pot plants.

From this table it is evident that the bacterized peat had no influence in increasing the yield of radishes, the average weights of the plants from Plots A and B being the same. The use of untreated peat had a slightly depressing effect, amounting, however, to only about 5 per cent. The only marked effect of the bacterized peat seems to have been in the comparative growth of roots and tops.

On Plot A the relative size of tops and roots is as 76 : 100.

On Plot B it is as 64 : 100.

On Plot C it is as 70 : 100.

The tops were therefore largest where the bacterized peat had been used, and smallest where nothing had been added. The contrast is perhaps more marked if we consider the average size of the roots alone.

Plot A 12·3 grams, Plot B 13·2 grams, Plot C 12 grams, or in terms of the untreated plot :—

Plot A (bacterized peat) 93; Plot B (untreated) 100; Plot C (untreated peat) 91.

Turnips.—The turnips were sown on land that had carried a crop of peas in 1913. and had been manured with farmyard manure for that crop. It had been well dug, was in good "heart," and was situated in the vegetable quarters.

Nine plots, each 33 feet by 7 feet 6 inches, were set out, and on each of them three long rows of the turnip 'Early White Stone' were sown 18 inches apart. There was therefore ample space between the rows. The seed was sown on May 25 at the rate of 8·5 grams to the row.

Plot 1 received no dressing.

Plot 2 received a dressing of bacterized peat at the rate of one ton to the acre (being 11 lb. to the plot).

Plot 3 received the same dressing, and in addition 150 grams of manganese sulphate was spread over the plot. (N.B.—Manganese sulphate has been reported to act under certain conditions as a stimulant of plant growth.*)

Plots 4 and 7 were treated as Plot 1.

Plots 5 and 8 as Plot 2.

Plots 6 and 9 as Plot 3.

The experiment was therefore in triplicate.

The seed germinated regularly and well, and there was no noticeable difference in the rate of germination. The plants grew away without check from flea beetles or from any other cause, and were thinned on June 24 and succeeding days.

It was found impracticable to thin and weigh the thinnings from the whole of the plots on one day, so that comparisons of the weights of the thinnings cannot be profitably made, but the indications point to some hastening of growth by the use of the bacterized peat, which was counteracted by the addition of manganese. The effect of

* CHITTENDEN, F. J. "The Effect of Manganese Sulphate on the Yield of Turnips at Wisley"; see p. 94, *ante*.

the manganese is, however, a side issue and may be ignored. If we leave out the plots which received manganese we get the following comparisons, the two plots compared having been weighed on the same day :—

	Weight of thinnings.	Weight of thinnings.	Weight of thinnings.
Untreated	4,740 grms.	5,724 grms.	9,405 grms.
Dressed with bacterized peat .	5,025 „	7,309 „	8,835 „

The plants, after thinning, were allowed to grow on, with the necessary attention to hoeing, and were all pulled, counted, and weighed on July 29, with the following results :—

Plot.	Dressing received.	No. of Plants.	Gross weight.			Average weight.		
			Tops.	Roots.	Total.	Tops.	Roots.	Total.
			Lb.	Lb.	Lb.	Oz.	Oz.	Oz.
1	Nothing	263	81·5	42	123·5	4·9	2·5	7·4
2	Bacterized peat, 11 lb.	261	96·75	39·25	136	5·9	2·4	8·3
3	Bacterized peat, 11 lb., +sulphate of manganese	207	89·75	44·25	134	6·9	3·4	10·3
4	Nothing	239	81·5	46·5	128	5·4	3·1	8·5
5	Bacterized peat, 11 lb.	221	89·25	45·75	135	6·5	3·3	9·8
6	Bacterized peat, 11 lb., + sulphate of manganese	197	79·25	39	118·25	6·4	3·1	9·5
7	Nothing	186	53·75	21·75	75·5	4·6	1·9	6·5
8	Bacterized peat, 11 lb.	180	54·5	22·75	77·25	4·8	2	6·8
9	Bacterized peat, 11 lb., + sulphate of manganese	185	61	29	90	5·2	2·5	7·7

The difference in the number of plants on the rows was due for the most part to the death of plants from various causes, and partly probably to the plants in the last set of three having been somewhat larger when they were thinned. Consideration of these figures shows that in all cases there was a slight increase in the average weight of the whole plant on the plots treated with bacterized peat, and this was generally increased where both peat and manganese sulphate had been added. The increase was more, however, in the tops than in the roots where peat alone was used, as the following figures, showing the relative weight of tops to roots, demonstrate :—

	Plot.	Roots.		Tops.	Average of three plots.
Untreated soil	1	100	:	194	
„ „	4	100	:	175	205
„ „	7	100	:	247	
Dressed with bacterized peat . .	2	100	:	246	
„ „	5	100	:	195	227
„ „	8	100	:	239	
Dressed with bacterized peat and manganese	3	100	:	202	
	6	100	:	203	205
„ „	9	100	:	210	

The sulphate of manganese appeared to redress the balance between root and top, interfered with by the bacterized peat.

Dwarf French Beans.—The land on which these were grown was in the fruit-experiment field, and had not been manured for some time. The soil was similar to that on which the radishes were sown, but no watering was attempted.

The ground was divided into three plots, each 30 feet long by 12 feet wide, and six rows of French bean 'Ne Plus Ultra' were sown on each plot, the rows being eighteen inches apart, and equal weights of beans (60 grams) being sown in each row.

Plot A received a dressing of 22 lb. of untreated peat, which was distributed evenly and hoed in.

Plot B had no treatment.

Plot C received a dressing of 22 lb. of bacterized peat, which was hoed in.

The seed was sown about the middle of May, and the seedlings just escaped the severe late frosts, which did so much damage to earlier-sown beans. They did not grow very large, as the season proved so dry, but were allowed to grow on and ripen their seeds, which were collected in the middle of October and weighed.

In the middle of August the plants on Plot A were somewhat yellow as compared with those on B and a little more backward, while those on C were much darker green, though apparently not quite so forward as those on Plot B.

The weights of seed obtained are shown in the following table:—

	No. of plants.	Weight of seed.
Plot A (untreated peat) . .	691	2692 grms.
Plot B (no manure) . .	737	2695 "
Plot C (bacterized peat). .	649	2685 "

The average yield from each plant was in all cases small, but that given by the plot receiving untreated peat was about 3 per cent. above that receiving nothing, while that receiving bacterized peat was 12 per cent. above that obtained from the "nothing" plot.

Grass.—The remainder of the peat in this consignment was sown on some poor grass lawn, a strip of about 10 feet in width and about 60 feet long being dressed at the rate of two tons to the acre. No benefit was visible from this dressing.

General Remarks.—In this Series the use of bacterized peat gave slight increases in yield in two of the four cases, viz. in turnips of 10 per cent. (mostly in the tops; of only 2 per cent. in the roots, which form the best basis of comparison*), and in French beans of 12 per cent. In radishes as in turnips the foliage was increased in size, but the total

* See CHITTENDEN, F. J. "On the Influence of Planting-Distance on the Yield of Crops," p. 89.

average weight of the plants was the same. In the grass no difference was visible. The actual gains were therefore very slight, and nothing like the result we had been led to hope for. Untreated peat had little effect, depressing the yield of radishes (but the roots were the same as when treated peat was used) and slightly increasing the yield of French beans. Since only one comparison was possible in the case of the radishes and French beans, differences of yield as great as those mentioned might easily occur quite apart from any influence of manure though they may have been caused by the manure.

IV. Series 3.—Experiments in the Open Ground artificially watered.

The results obtained in the second series of experiments were far less favourable to the peat than those obtained in the first. This became evident while the turnips and radishes in the second series were still growing, and the reason seemed to lie in either :

1. A difference in the chemical composition of the peat used, or
2. The operation of some limiting factor present in the open, and absent from the series grown under glass, or
3. The relatively small quantity of bacterized peat.

The weather had been very dry during the season of growth, and this suggested the possibility that insufficient water had been available for the full benefit of the peat to be felt in the experiments in the garden. In order to test this, Dr. KEEBLE suggested a further series of experiments where some of the plots should be kept well watered and the others should receive only the water which fell as rain. A series of this nature was arranged, and at the same time the opportunity was taken to compare the action of the peat with that of farmyard manure and of other soil treatments.

The site chosen was a piece of rather poor ground which had not been manured recently, and, as will be seen from the plan (fig. 89), the experiment occupied eleven plots, which were repeated four times, and placed so as to neutralize errors arising from variation in the soil as far as possible.

Plots 7 and 8 were added to ascertain whether the presence of lime to neutralize the acid of the peat exercised any influence on the yield. As will be seen, the dressing of farmyard manure was quite light (at the rate of 20 tons to the acre), that of the bacterized peat 1 ton to the acre.*† Plots 8, 9, and 10 received no artificial watering, but all the others were watered four times during the growth of the plants, the same quantity of water being put on each plot on the same day, about one gallon a square yard or a little more being used on each

* *I.e.* twice as heavy as the dressing recommended in the recently published book already alluded to.

† It should be remembered, in comparing the weight of farmyard manure with that of peat used, that the former contains a very much larger quantity of water than the latter. The bacterized peat used in the second and subsequent series had been dried before sending out.

occasion. This, combined with the hoeing which all the plots alike received at frequent intervals, was sufficient to keep the soil on these plots always in a moist condition. The unwatered plots did not suffer at any time from drought, but, as will be seen, the additional

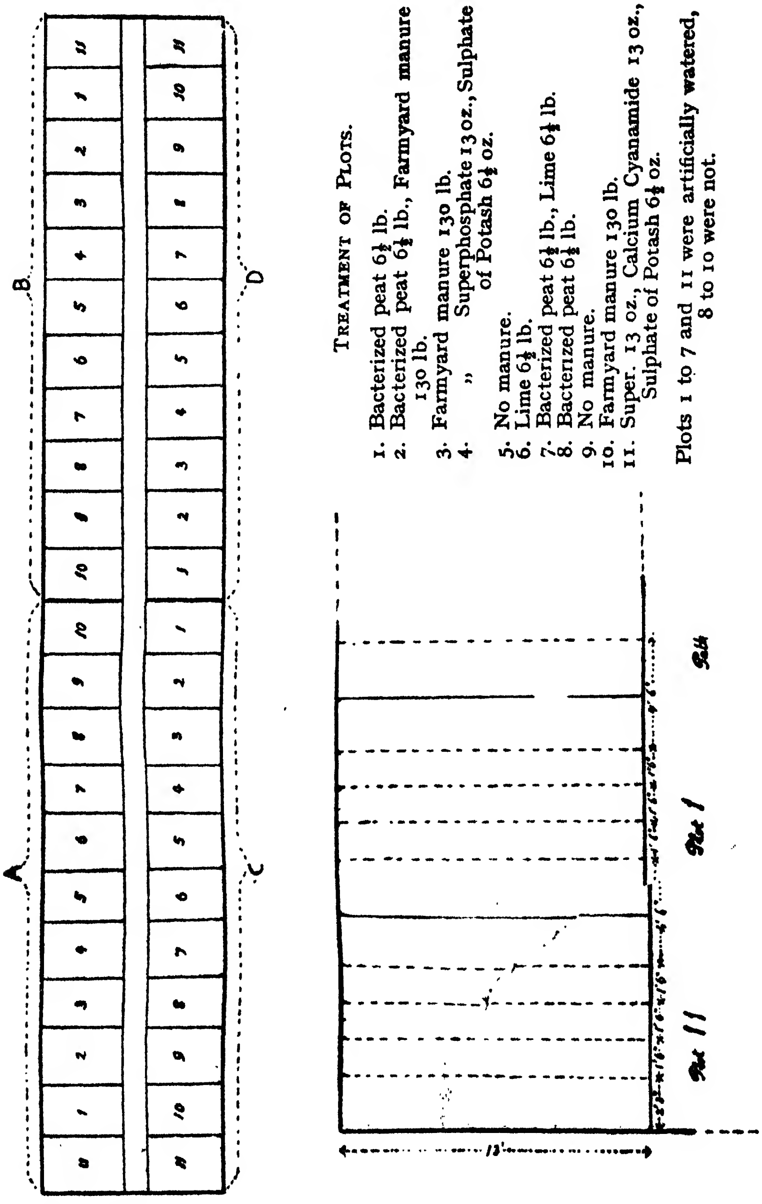

FIG. 89.—PLAN OF PLOTS IN SERIES 3 OF BACTERIZED PEAT EXPERIMENTS.

water used upon the artificially-watered plots led to an increase in yield in most cases.

The plan (fig. 89) shows the arrangement of the plots, and the smaller one the placing of the rows on the plots.

Turnips were used for this experiment, the variety 'White Stone' being chosen. Four rows were sown on each plot, 3 grams of seed being sown in each row. The seed was sown on July 16, and the plants were up on all plots on July 19. The plants grew away well, and except 11B and 11D none suffered from the attack of any pest. On the two plots mentioned some of the seedlings were destroyed by birds.

All the plots were thinned on August 4 and the thinnings weighed, the plants being left about 9 inches apart.

They were left to grow, with the watering and hoeing already alluded to at intervals, until September 28, when all were lifted and weighed. A few plants died on some of the plots, so the plants were counted as they were pulled and the average weights used as a basis of comparison.

The following table shows the action of the various treatments on stimulating early growth:—

WEIGHT OF THINNINGS REMOVED FROM PLOTS AUG. 4, 1914.

Plot.	Dressing.	Group A.	Group B.	Group C.	Group D.	Total.	Relat. Wts.	Relat. Position.
		Grms.	Grms.	Grms.	Grms.	Grms.		
1	Bact. peat . .	3,815	2,900	3,105	3,650	13,470	79	6
2	Bact. peat and farmyard manure . .	4,425	3,690	4,215	4,560	16,890	100	1
3	Farmyard manure .	4,310	3,340	3,915	4,405	15,970	95	2
4	Farmyard manure and artificials . .	4,420	3,360	3,900	4,060	15,740	93	3
5	No manure . .	3,780	2,940	2,885	3,825	13,430	79	6
6	Lime . . .	2,915	3,100	2,390	3,215	11,620	69	9
7	Bact. peat and lime .	4,030	3,205	2,665	4,260	14,160	83	4
8	Bact. peat . .	3,210	3,275	2,590	3,465	12,540	74	8
9	No manure . .	2,890	2,630	1,890	3,200	10,610	63	10
10	Farmyard manure .	3,285	3,495	2,840	3,920	13,540	80	5
11	Artificials . . .	3,430	3,095*	5,400†	2,615*†	??		

Arranging these results in order, we find the plots that received both peat and farmyard manure at the top, followed closely by those that had farmyard manure alone, farmyard manure and artificials, and then peat and lime. All these were artificially watered. Following these and very close together come farmyard manure without artificial watering, peat with water, and the watered no manure plots. Then in order come peat without water, lime with water, and no manure without water.

The effect of the farmyard manure in stimulating growth in the early stages is most remarkable. It must, of course, be remembered that a great amount of water is held in the farmyard manure when it is applied to the soil, and this must have had some influence in stimulating early growth, but at the same time it is clear that none of the plots suffered from drought in the very early stages, as a shower

* These had been interfered with by birds.

† A shower fell before these could be pulled, and the figures are therefore not comparable with those of the other rows.

fell soon after the sowing of the seed and all the seedlings were up on the third day. The effect of the manure was evident not only in the greater size of the plants but in their darker colour; indeed, the contrast in colour between those that received farmyard manure and those that did not was very marked on all the plots.

Peat had also some stimulating effect where no artificial watering was done, though much less than that exercised by the farmyard manure, and the combination of the two gave the best results in all parts of the ground. Lime alone had a retarding effect, but in combination with peat the stimulating effect is evident, while peat alone exercised very little influence on the watered plots.

The following table shows the results of the final weighing when the plants were pulled on September 28, and also the comparative weights of roots and tops.

The plants and weights on all the four plots which received similar treatment are added together, and the weights averaged in the last columns.

Plot.	Dressing.	No. of Plants.	Gross Weight.			Average Weight.		
			Tops.	Roots.	Total.	Tops.	Roots.	Total.
			Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1	Bact. peat . .	319	106	205	311	·33	·64	·97
2	Bact. peat and farmyard manure .	337	116·5	227	343·5	·34	·67	1·01
3	Farmyard manure .	329	114	222	336	·34	·68	1·02
4	Farmyard manure and artificials .	308	123	209	332	·4	·67	1·07
5	No manure . .	335	93	206·5	299·5	·28	·69	·89
6	Lime . . .	300	90·5	197·5	288	·3	·66	·96
7	Bact. peat and lime	310	103	216	319·5	·33	·7	1·03
8*	Bact. peat . .	337	99·5	189	288·5	·29	·56	·89
9*	No manure . .	309	94	185	279	·3	·6	·9
10*	Farmyard manure .	310	89·5	196	285·5	·29	·63	·92
11	Artificials . .	312	86	169·5	255·5	·27	·54	·81

If we take the gross weights as a basis of comparison we find the order is the same as that revealed by the weights of thinnings, except that Plot 10 (farmyard manure, no artificial watering) takes a lower place, but it will be better to compare the average weights of the plants, as there was some variation in the number of plants that survived on each plot to the end.

It would be better to leave Plot 11 out of the calculations, for no doubt the cyanamide delayed growth to some extent, and, as has already been pointed out, the plants received a check in their early days on these plots alone.

Considering first the plots 1 to 7, which were artificially watered, and taking the average weights of the whole plants, we find the order is as follows:—

1. Plot 4. Farmyard manure plus artificials . . . 100
2. „ 7. Bacterized peat plus lime 96

* Not artificially watered.

3. Plot 3. Farmyard manure 95
4. „ 2. Farmyard manure plus bacterized peat . . 94
5. „ 1. Bacterized peat 91
6. „ 6. Lime 90
7. „ 5. No manure 83

Comparing now those which received no artificial watering, we find the following order :—

1. Plot 10. Farmyard manure 100
2. „ 9. Nothing 98
3. „ 8. Bacterized peat 97

In both groups the farmyard manure plots had the heaviest plants, and where bacterized peat was used in conjunction with water it had a good effect, but not so great an effect as farmyard manure, especially when assisted by artificials; when used alone (without artificial water) it actually reduced the yield. In conjunction with lime and watering the yield was about equal to that given by farmyard manure and peat in conjunction with farmyard manure.

The greatest average weight of roots was given by the peat in conjunction with lime; next came farmyard manure, farmyard manure in conjunction with artificials, and farmyard manure in conjunction with peat; the other plots followed in the order, lime alone, bacterized peat alone, no manure being last. Where no artificial watering was resorted to, farmyard manure was first, no manure next, bacterized peat last.

There was less difference between the weights of roots on the different plots than between the total weights, which points to the fact that the greatest difference was in the weight of foliage. On the no manure plot, the weight of root to foliage was as 100 : 46 ; whereas on Plot 4, which gave the heaviest plants, it was as 100 : 59. On the whole the stimulating effect of the manures (except the lime) was seen in the foliage rather than in the roots.

The question whether the extra water given on certain plots increased the yield is conclusively answered by the following figures :—

Manure used.	Average Weight.		
	Not watered artificially.	Watered artificially.	Difference.
	Lb.	Lb.	Lb.
Farmyard manure	·92	1·02	+ ·10
Bacterized peat	·85	·97	+ ·12
No manure	·90	·89	— ·01

Whereas the watering where no manure was added made no difference, where farmyard manure was used and where peat was used the water apparently assisted in setting free some substance which the plants could make use of. Where no water was used peat had no stimulating effect.

The second question, as to whether bacterized peat is likely to increase growth provided sufficient water is present, is also answered in the affirmative, as the following figures show :—

	Average weight.	Average increase.
	Lb.	Lb.
No manure	·89	·08
Bacterized peat	·97	
Lime	·96	·07
Lime and bacterized peat	1·03	

The difference is, however, small compared with that shown by the plants in pots, and its comparative smallness suggests, as did the experiments in Series 2, that probably the increases obtained in Series 1 were due rather to the amount of available nitrogen or other earth salt added than to any continuing and abnormal activity of bacteria in the soil. If this were the case a smaller addition of the bacterized peat would naturally be accompanied by smaller results, but even so if we assume the nitrogen content of the peat to be 4·3 per cent. as the analysis published showed, the dressing of 1 ton applied should have supplied more nitrogen than is contained in the abnormally heavy dressing of 6 cwt. of nitrate of soda to the acre. One or two cwt. of nitrate of soda should amply suffice to produce marked results in a crop of turnips. Judging by the results, nothing like this amount of nitrogen was available for the crop, and this suggests that the manufacture of the peat has not yet been standardized.

Comparison of the value of this material with that of other manures is under these conditions impossible, nor have we any information to enable us to compare its value from an economic point of view, for we are not told at what price the bacterized peat can be sold.* Until we know this all lengthy discussion of the subject is futile, and it will suffice to say that this series of experiments shows that the dressing given will not take the place of a light dressing of farmyard manure such as that used on the comparative plots, as the following figures show :—

	Average Weight.	
Water applied :	Lb.	Lb.
Bacterized peat	·97	
Farmyard manure	1·02	–·05
No water applied :		
Bacterized peat	·85	
Farmyard manure	·92	–·07

We are not certain that the bacterized peat used in the second series of experiments was the same in composition as that used in the third, but it was similar in appearance. Assuming that the composi-

* See p. 326.

tion was similar, it does not appear that the small rainfall at the time of growth of the turnips in that series is to be blamed for the comparatively small benefit derived from the use of the peat, though it may have had some influence in that direction. It is to be remembered, however, that the soil was in a moister condition at the earlier date than at the later, and would therefore assist in making available the constituents of the peat.

Experiments in 1915.

A fourth consignment of about 1 cwt. of bacterized peat was received from Professor BOTTOMLEY at the beginning of May 1915. It had been designed to carry out a number of tests with this in the Laboratory, as there are many questions of great interest involved, but absence of laboratory accommodation during building operations and disorganization of the staff owing to the war prevented this. Two series of tests (Series IV. and V.) were, however, carried out with it during the summer.

The peat received was dark brown in colour and in small particles, and was evidently made of the same type of material as before.

V. Series 4.—Experiments under Glass and in the Open.

The plants chosen for this series of experiments were radishes (' French Breakfast '). The pots used were 10-inch pots, and the loam of good fibrous quality.

Three pots containing 3 parts of loam and 1 of peat were sown and grown in a cold house, together with six pots containing loam alone. A similar set was placed outdoors and covered with wire to protect them from the birds. The seeds in the soil containing peat grew very badly, and most of the seedlings both outdoors and indoors sickened and died, so that only twenty reached maturity in the three pots indoors and fourteen in those outdoors. The same quantity of seed was sown in each pot, and the plants grew away much better in the pots containing loam alone, the six pots indoors yielding when the roots were pulled and weighed in mid-August 123 plants, those outdoors 112. These inequalities in number render any comparison of weights unprofitable, and the only case where there were equal numbers of plants in the pots containing loam alone and loam and peat respectively under the same conditions was one outside. Here the twelve plants in the " loam " pot gave a total weight of 274 grams, the twelve in the " loam and peat " pot 267 grams, the relative weight of the tops as compared with the roots being greater in the latter than in the former.

The seedlings in the loam-peat pots had, at first, the appearance of suffering from manure poisoning.

VI. Series 5.—Experiments in the Open in Ordinary Garden Soil.

The plant used in this series of experiments was Turnip ' Early White Stone.' The site was on ground well dug in the previous spring,

but not manured. It had carried vines for about six years and had received no manure during that time. The ground was thought to be fairly uniform, but proved to be much less productive at the southern end of the site, and a vein of slightly better soil ran diagonally across it, but touched all the plots, and therefore made little difference in the results. Fortunately the plots arranged were in triplicate, and the error due to inequalities in the soil is reduced to a small amount.

Last year's experiments suggested that the probable source of the increased yield obtained was due to the nitrogen contained in the bacterized peat. The turnip has proved on our soil useful for estimating the value of nitrogenous manures * and is probably the vegetable crop best adapted for weighing, and it was for these reasons selected.

Twelve plots, each 33 feet by 7 feet 6 inches, were set out, and on each of them three long rows of the turnip were sown 18 inches apart on July 10 at the rate of 6 grams of seed to the row. The arrangement of the plots is shown on the plan (fig. 90).

Plots 1, 5, and 9 received no dressing.

Plots 2, 6, and 10 received a dressing of bacterized peat at the rate of 1½ ton to the acre (being 16½ lb. to the plot). It was distributed and thoroughly hoed in before the seed was sown.

Plots 3, 7, and 11 received a like dressing, together with 11 lb. slaked lime to each.

Plots 4, 8, and 12 received a dressing of 11 lb. slaked lime only.

The experiment was therefore in triplicate.

The seeds germinated freely and regularly, and received no check from pests. They were thinned to about 8 inches apart on August 10, and the thinnings from each plot, free from earth, were weighed immediately on removal. The results are set out in the following table :—

WEIGHT OF THINNINGS REMOVED FROM PLOTS AUGUST 10, 1915.

Dressing.	Group A.†	Group B.†	Group C.†	Total.
	Grams.	Grams.	Grams.	Grams.
No manure	7,153	3,397	4,208	14,758
Bacterized peat	11,312	8,765	6,790	26,867
Bacterized peat and lime . . .	8,225	9,155	3,539	20,919
Lime	3,350	3,765	3,775	10,890

It will be seen that the plants on the plots which had been dressed with peat grew much more rapidly than did those on the plots receiving none. They appeared much greener and taller, and the weighings confirmed the impression their appearance made.

This superiority was not, however, maintained for long, as will be apparent from a consideration of the final results obtained when

* CHITTENDEN, F. J.: "Calcium Cyanamide and Nitrate of Lime," *Journ. R.H.S.* xxxvi. p. 610.

† Plots 1 to 4 are designated Group A, 5–8 Group B, 9–12 Group C.

N

Plot 1. - No Manure
Plot 2. - Bacterized Peat 16½ lb.
Plot 3. - Bacterized Peat 16½ lb. Lime 11 lb.
Plot 4 - Lime 11 lb.
Plot 5. - No Manure
Plot 6. - Bacterized Peat 16½ lb.
Plot 7. - Bacterized Peat 16½ lb. Lime 11 lb.
Plot 8 - Lime 11 lb.
Plot 9. - No Manure
Plot 10. - Bacterized Peat 16½ lb.
Plot 11. - Bacterized Peat 16½ lb. Lime 11 lb.
Plot 12. - Lime 11 lb.

FIG. 90.—PLAN OF EXPERIMENTS SERIES 4 WITH BACTERIZED PEAT AND TURNIPS, 1915.

the turnips were pulled and weighed on October 18. These weights are set out in the following table:—

Plot	Dressing.	No. of Plants.	Gross Weight.			Average Weight.		
			Tops.	Roots.	Total.	Tops.	Roots.	Total.
			Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1	No manure .	200	38·75	136·25	175	·193	·682	·875
5	,, .	188	18·75	72·5	91·25	·099	·386	·485
9	,, .	185	17·25	73·25	90·5	·093	·396	·489
Totals . .		573	74·75	282	356·75	·134	·491	·625
2	Bacterized peat	186	26·75	130·5	157·25	·144	·701	·845
6	,,	194	19·5	93·75	113·25	·101	·483	·584
10	,,	204	15·5	69·25	84·75	·076	·341	·417
Totals . .		584	61·75	293·5	355·25	·107	·503	·610
3	Bacterized peat and lime	188	24	124·75	148·75	·128	·663	·791
7	,,	182	18	105·5	123·5	·098	·580	·678
11	,,	199	16·5	63	79·5	·083	·316	·399
Totals . .		569	58·5	293·25	351·75	·103	·518	·621
4	Lime . .	183	17·5	76·25	93·75	·096	·416	·512
8	,, . .	190	15·75	70·75	86·5	·083	·372	·455
12	,, . .	197	16·25	75·5	91·75	·082	·383	·465
Totals . .		570	49·5	222·5	272·0	·087	·390	·477

As we have already pointed out, the weight of roots is perhaps the best thing to take as the measure of the result (p. 314), and an examination of the figures given above, taken in conjunction with the plan (fig. 90), shows such slight differences as to be almost negligible, except with the lime alone. Lime alone in this series of experiments depressed the yield to a very marked extent, but only 2 per cent. increase was obtained over the no manure plot by the addition of the bacterized peat, and 5½ per cent. by the addition of bacterized peat and lime. Even these figures depend upon results too fluctuating on the various plots to mean a really consistent increase. The failure to produce a strikingly increased crop cannot be attributed to conditions of drought while the crop was growing, for the soil was moist and in good condition when the seed was sown (over 2 inches of rain having fallen in the three weeks preceding the sowing), and 6·71 inches during the three months the turnips were growing. It is also open to doubt whether, even if lack of water were the cause of failure of the peat to increase the yield, the fact would be of much significance in ordinary vegetable garden practice, still less in the market garden or the farm, for the irrigation necessary would add very greatly indeed to the cost of growing the crop, the cost of obtaining results from the application of the manure, and therefore to the cost of the manure. The peat was added at the rate of 1½ ton to the acre. Assuming it to have been of the composition given in the analysis we have already

quoted, this would have added over 144 lb. of combined nitrogen to that area, an extraordinary dressing, equalling the amount contained in about 10 cwt. of nitrate of soda, or, if only half were in an available condition, equal to the very heavy dressing of 5 cwt. of nitrate of soda to the acre. The results certainly do not justify the assumption that its composition was anything like this.

This failure is distinctly disappointing, coming on top of those of the outdoor trials last year, and, taking into consideration the remarkable results obtained indoors in the first series, strengthens the belief that differences in mode of manufacture or accidents during the process may be answerable for the differences in the behaviour of the material. Until it is possible to place upon the market a material of standard composition, or at least varying within narrow limits in its behaviour, it is too soon to recommend the wide application of what may, under other conditions, prove to be a very valuable manure.

I have already alluded to the suggestions made by Dr. KEEBLE with regard to Series 3 of these experiments, and I have also to acknowledge the kindness of Professor BOTTOMLEY in supplying the peat, and the active assistance at different times of Messrs. J. K. RAMSBOTTOM, G. M. OWEN, L. C. EDWARDS, H. C. POWELL, W. C. CROOM, H. J. BARKER, and other senior students in carrying out the work connected with the experiments.

SUMMARY AND CONCLUSIONS.

(1) Bacterized peat is a preparation of bog moss acted upon by certain bacteria, and subsequently used as a culture medium for the development of nitrogen-fixing bacteria. The exact details of its manufacture are not divulged. On this account most of the experiments possible with it are of an empirical nature.

(2) An endeavour was made to ascertain whether it had a stimulative effect upon growth, and three samples were received in 1914 and one in 1915, all from Professor BOTTOMLEY, and used in five separate series of experiments.

(3) In Series 1, carried out indoors on various plants, the results were extraordinary and very uniform, growth being greatly increased by the use of the bacterized peat (p. 308).

(4) In Series 2, carried out in the open on three different kinds of plants, the results, while somewhat in favour of bacterized peat, were not what we had been led to hope for (p. 311).

(5) Series 3 was designed principally to see whether the somewhat dry summer was to blame for the comparatively small benefit seen outdoors, but on turnips the increase due to peat when ample water was available was only about 9 per cent. (nothing approaching that seen in the indoor experiments) (p. 315).

(6) A comparison was also made as to the result obtained by the use of a light dressing of farmyard manure (20 tons to the acre), the

peat being used in this series at the rate of 1 ton to the acre, and it was found that the farmyard manure gave in each case a heavier yield (p. 317).

(7) The experiments in Series 4 were inconclusive (p. 321).

(8) Series 5 was a partial repetition of Series 2 with another sample of peat in 1915. The increase obtained when peat was added to the soil was only 2 per cent., and when peat and lime were both added 5½ per cent., a result practically negligible, taking into consideration the cost of the application (p. 321).

(9) It is clear from our experiments that the full results are seen from the use of peat only when the supply of water is abundant, but the results in Series 2 and 5 were probably only slightly interfered with on this account, and in Series 1 and 3 this factor was eliminated.

(10) The results on the whole show that when prepared under the best conditions bacterized peat is capable of acting as a very effective manure, but the meagre results obtained in the different series of experiments outdoors point either to a great variability in the composition of the different samples of the peat sent us, or to the action of some chemical constituent alone, possibly the nitrogen, the nitrogen being probably much below the quantity shown in the analysis quoted.

(11) The report we are able to make on it applies merely to the samples with which our experiments were carried out, and there is nothing to show that other samples would give the same results.

(12) It is also clear that if a sample could always be relied upon to be of the same quality as the first received the value of the material for plants in pots would be great, but it seems apparent that Professor BOTTOMLEY is still experimenting with the material and has not yet settled upon a fixed product or a fixed method of preparing it.

(13) We are not informed of the cost of the prepared peat, and can therefore make no comparison of it from an economic point of view.*

* Since this report was completed the book referred to in the footnote on p. 311 has been published (*The Spirit of the Soil*, by G. D. KNOX), and we are there informed that the price has been fixed at £10 a ton for the time being, though it may be considerably less "when the substance is dealt with commercially" (p. 154). We are not told whether the cost includes carriage to the garden in which it is to be used or not—a point of considerable importance to market gardeners, and to others who use large quantities of manure.

We are told also (p. 154) that the value of "the available plant food in peat, as compared with that in rotted stable manure, is as between fifty and eighty to one."

In the experiments in Series 3 described above (p. 315) we were able to compare the results obtained by dressing with peat (1 ton) with those obtained by the addition of 20 tons of farmyard manure which would cost delivered £8. In each case where comparison was possible farmyard manure gave a heavier yield than the bacterized peat which would cost more.

COMMONPLACE NOTES.

By the Editor.

Irrigation for Alpine Plants.

The following note from Mr. R. C. Appleton, of Molescroft House, Beverley, East Yorks., on a method of constructing and watering a bed for alpine plants will be read with interest by many. It is a special application of a method of sub-irrigation which has proved useful in many gardens for various purposes, and which will doubtless become more common as time goes on.

"Please bear in mind the bed is twenty-five feet long, and sixteen feet wide. The thickness of the usual alpine root soil over coarse drainage is eighteen inches; three-inch drain tiles are laid on at six inches; so there are nine inches of soil above them. A variety of plants from hill pastures and up to the shingles were taken from pots and planted early in March, just as growth was starting. Demur will be taken by some, who will say they were put into fresh soil when it was cold. Practice tells me such a plan is better than planting when growth has advanced. Also it may be urged that the mode of planting is open to objection. This was the way it was done. The plants were inserted so far that the surface of the pot soil was level with the ground; no attempt was made to put them in deeper, as is suggested so often. Then the soil around was rammed. A number were planted, then surface material was put on, for the delay to the next day might have allowed of damage by a frost. Of course the crowns were regarded; elsewhere not less than three inches were applied. This was crushed brick mixed with a little soil from the woods. Broken with a geologist's hammer, the shattered bricks were put into a fine riddle to get rid of the powder, then all that went through a quarter-of-an-inch mesh riddle was used. I know of no better material for alpines; it contains 'ash' and salts which plants extract, or which is washed out for them. The body of the bed had become firm in the winter. Nothing more seems required, except an almost general dusting of powdered chalk.

"From March 12 to May 21, ten weeks, the rainfall was just over two inches. North-East Yorkshire is notorious for being almost the driest part of Great Britain. It gets more than a fair share of north-east winds. The conditions this year were ideal for testing the method of applying moisture. The water-can is useless with such a climatic vagary. So far as alpines are concerned, this season (1914) has been one of semi-drought, just when it was not desirable.

"The experiment is a success at present, The earth can be moistened (with air carried to it) to a nicety. By capillarity the moisture ascends to one-and-a-half inches from the surface. When water is poured into a sanitary pipe at the top of a one-and-a-half-inch incline and continued until it reaches the rim of the pipe as the distal end, then the next is charged. It is striking how much moisture the earth around these field drain tiles can absorb. We can gauge easily when the soil is wet enough. The point to attain is a fair moisture balance. In this trying spring about fifty gallons of water are required each week. A rubber hose is attached to a tap, and the pipes are filled in a few minutes.

"We are entreated to put a lot of things in half shade. What is the crux about shade and half-shade-loving plants? Moisture? In contrariness I have purposely placed many in this bed, where they get all the sunshine we have. Not one has suffered; indeed everything thrives with this subterranean watering. While all is well in spring and summer, the construction of the bed will prevent wet lodging in winter; in addition, while the tiles will not contain water in the latter period, plenty of air will reach the roots through them, and it not be chill air."

Nomenclature of Sedums.

Our appeal for Sedums to grow on in order to clear up the confused nomenclature met with a ready response, and with the aid of Mr. Lloyd Praegar, B.A.,B.Sc., much progress has been made, but we should be very grateful for further specimens from as many sources as possible. It is probable that many uncommon forms are growing in a few gardens where they were perhaps planted many years ago, which we have not yet secured, and pieces of which we should be glad to have. Specimens should be addressed to The Director, R.H.S. Gardens, Wisley, Ripley, Surrey.

An Iris-Planting Experiment.

The recommendation is usually made to plant tall bearded Irises immediately after flowering. This is the practice we have ourselves followed for many years with success, but Mr. E. H. Jenkins, a member of the Floral Committee, suggested in 1913 to us that better results would be obtained if the planting were done in March, and asked us to make a comparative trial. We accordingly lifted six pieces of each of three well-marked varieties and planted them on March 25 in an open place. Each piece consisted of a single growth and a single piece of rhizome. The varieties selected were one of the *germanica* section, 'Argus'; one of the *variegata*, 'Gracchus'; and one of the *pallida*, 'Queen of May.' No new strong roots were being formed at this time, and only in 'Argus' were new laterals growing, while the lateral buds were so small as to be almost invisible.

Of these pieces only one of 'Queen of May' produced a flower in May 1913, four of 'Gracchus,' and none of 'Argus.' On June 24 six

similar pieces of each were lifted and planted side by side with the March-planted ones. These pieces were such that they had reached the same development in March as had those then lifted. The new buds were advancing and new main roots were just beginning to develop.

Every one of the March-planted 'Argus' flowered in October of that year, but none of the others.

The number of spikes of flowers produced by each set of plants at the different seasons up to June 1915 is shown in the following table:—

Variety.		Number of spikes produced.			
		Oct. 1913.	May 1914.	Oct. 1914.	May 1915.
Argus . . .	March planted	6	16	0	58
	June planted	0	4	6	32
Gracchus . .	March planted	0	43	0	98
	June planted	0	14	6	51
Queen of May .	March planted	0	6	0	29
	June planted	0	3	0	4

It is evident that the March planting gave better results in future years than did the June planting, but it must not be overlooked that most of the 1913 flowers were lost.

PRIMULA FRONDOSA Janka.

In 1873 Janka described a Primula, which he had found in the Rhodope Mountains of Bulgaria, under the name of *P. frondosa*. Subsequently a plant was introduced to gardens under this name and spread widely wherever alpine plants were cultivated, for it was a robust form with wide leaves, mealy below, allied to the popular *P. farinosa*, coming freely from seed, and not a very difficult plant to grow. Pax, in his Monograph of the Primulaceae (1905), cast doubt upon the identity of the plant grown in gardens under this name, as it did not quite agree in appearance in one or two points with herbarium specimens which he examined. Monsieur Alaric Delmard, F.R.H.S., to whom we applied in the hope of getting seed of wild plants, kindly interested himself in the matter, and at his request Mr. Kellerer, the head gardener to H.M. the King of Bulgaria, very kindly sent us a plant collected in the *locus classicus* of the species for comparison with the garden plant. We have grown this plant for two years at Wisley in the Alpine House, where it has thriven and flowered well. It leaves no doubt that the garden plant is correctly named, and identical with that discovered by Janka.

NATIONAL DIPLOMA IN HORTICULTURE.

THE first Final Examination of Professional Gardeners for the National Diploma in Horticulture, established by the Society with the sanction and co-operation of the Board of Agriculture, took place in June and July 1915. Twenty-two candidates who had qualified by passing the Preliminary Examination last year sat for the Final Examination, viz. fourteen in Section I (General Horticulture), of whom eleven passed; two in Section I*c* (Fruit-growing for market), both of whom passed; two in Section II (Hardy Fruit-growing for market), who both passed; one in Section III*f* (Market gardening in the open), who passed; three in Section VII (Horticultural Inspection), of whom one passed; one in Section VIII (Horticultural Instruction), who failed to satisfy the Examiners.

The second Preliminary Examination was held in June, twenty-one candidates presenting themselves, of whom ten passed.

Both examinations consist partly of written papers and partly of practical work in the garden and verbal questioning by the Examiners. The practical work in the case of the Preliminary occupies one day, and of the Final two days, the work being done in the presence of the Examiners. This year all the candidates were brought to Wisley in order that the conditions under which the work was done should be as nearly equal as possible.

The Examiners report that on the whole the written answers and much of the practical work were satisfactory, but in several cases candidates failed to satisfy them in the tests of craftsmanship and in their knowledge of garden plants. Perhaps the greatest faults were observable in the exercises in pruning, but the work of several candidates in the Preliminary Examination lacked finish, and in some cases there was evident lack of general elementary horticultural knowledge.

The Preliminary Examination is essentially an examination designed to test the general horticultural knowledge of the candidates, while the Final is a more searching and thorough examination in the special branches which the candidate himself chooses, as is set out in the Syllabus. It cannot be too strongly emphasized that the central part of the test is the practical work in the Garden, and that no candidate who fails to satisfy the Examiners in this part of the test can under any circumstances pass, no matter how good so ever his written papers may be.

Those candidates who succeed in satisfying the Examiners, especially in the Final Examination, may be congratulated on having come triumphantly through a really stiff ordeal, and on having proved themselves worthy to receive the high mark of distinction which the

National Diploma in Horticulture confers, given as it is under a scheme drawn up by the Royal Horticultural Society and with the sanction and co-operation of the Board of Agriculture.

W. Wilks,
Sec. R.H.S.

LISTS OF SUCCESSFUL CANDIDATES.

Final Examination.

Section I.

Chislett, W., Oakleigh, Bishopsworth, nr. Bristol.
Cope, Gertrude, Manor House Gardens, Northfield, Birmingham.
Cornelius-Wheeler, Sylvia E., Elmwood School of Gardening, Cosham.
Costin, F. W., Clemsford, Shinfield, Reading.
Crisp, Wm. C., Woodcote Grove Cottage, Coulsdon, Surrey.
Green, John James, Higher King Street, Hurst, Ashton-under-Lyne.
Jones, H. L., The Gardens, Clerk Hill, Whalley, nr. Blackburn.
Melles, Alfred B., 39 Bushwood Road, Kew, Surrey.
Stewart, Wm., Desford, nr. Leicester.
Titchmarsh, C. C., R.H.S. Gardens, Wisley, Ripley, Surrey.
White, Wm. C., 46 Frederick's Road, Beccles, E. Suffolk.

Section Ic.—Fruit-growing under Glass and in the Open.

Griffiths, Frank A., South View, Alverstone, Brading, I. of W.
Stuart, George, 13 George Square, Edinburgh.

Section II.—Hardy Fruit-growing for Market.

Wright, Charles W. B., 7 St. Vincent Street, Edinburgh.
Goude, Henry, Elvin Road, E. Dereham, Norfolk.

Section IIIf.—Market Gardening—Outdoor.

Verrall, Florence M., Letheringsett, Holt, Norfolk.

Section VII.—Horticultural Inspection.

Richardson, Thomas, 106 Fairholm Road, Benwell Grove, Newcastle-on-Tyne.

F. J. Chittenden, F.L.S.
W. Crump, V.M.H.
F. G. Drew.
W. Hales, A.L.S.
H. Hooper.
W. Poupart.
A. G. L. Rogers.

Examiners.

PRELIMINARY EXAMINATION.

Division A.

Turner, A. D., Madryn Castle Farm School, Pwllheli, N. Wales.

Division B.

Gibson, Robert, The Spital Gardens, nr. Hexham.
Gunnell, Edna M., Horticultural College, Swanley, Kent.
Payne, Thos., 223, Bramford Road, Ipswich.

Division C.

Henry, David G., 3 Meadowbank Crescent, Edinburgh.
Macey, Archibald, Rufford Abbey Gardens, Ollerton.
Moody, Alfred B., 28 Drake Street, Enfield.
Simms, Joseph E., 44 New Road, Grays, Essex.
Smith, Henry A., The Castle Gardens, Bothwell, Lanarkshire.
Thrupp, Hilda M. B., 24 Woronzow Road, St. John's Wood, N.W.

F. J. Chittenden, F.L.S.
W. Crump, V.M.H.
F. G. Drew.
W. Hales, A.L.S.
} *Examiners.*

GENERAL EXAMINATION IN HORTICULTURE.

MARCH 31, 1915.

ONE HUNDRED AND THIRTY-FIVE candidates entered for the Society's Senior General Examination held on March 31, 1915. Three of these, however, did not present themselves on the date appointed.

The Examiners, the Rev. Prof. G. Henslow, M.A., V.M.H., and Mr. James Hudson, V.M.H., report that of the senior candidates only two were considered worthy of a place in the First Class—all of their eight answers being excellent; 34 or a little over 25 per cent. in the Second Class; and 83 or 61 per cent. in the Third Class. Thirteen candidates failed to show a sufficiently high standard of knowledge to appear in the List.

Seventy candidates entered for the Junior Section. The Pass List shows only two candidates to have obtained a first class, two a second, and six a third class. In the Fourth Class there were 25 or 33 per cent.; while there were 35 or 50 per cent. who failed to satisfy the Examiners.

It is presumed that the reduced number, both of senior and junior candidates, is directly or indirectly consequent upon the war; and this, no doubt, also explains the small proportion gaining first and second class places. It is hoped that the time is not far distant when the numbers will again rise to the high average of recent years.

W. WILKS, *Secretary.*

SENIORS: over 18 years of age.

Class I.

1. Syer, K. L., Thatcham Fruit and Flower Farm, Newbury.
2. Tufnell, E. I., Horticultural College, Swanley.

Class II.

1. Boyle, W., Madeley Court, Shropshire.
2. Lewis, C., 78 Plymouth Road, Penarth.
3. { Crosland, L., Studley College, Warwickshire.
   Redmayne, G. B., Studley College, Warwickshire.
   Sparks, E. M., Elmwood School of Gardening, Cosham.
   Traill, M., Studley College, Warwickshire. }
7. Jack, M. McC., Studley College, Warwickshire.
8. Stewart, S. T., Horticultural College, Swanley.

9. Gadsden, L. H., Thatcham Fruit and Flower Farm, Newbury.
Gould, N. K., R.H.S. Gardens, Wisley, Surrey.
Hartley, S., 182 Edmund Street West, Rochdale.
Mortimer, K. D., 12 Clifton Hill, St. John's Wood.
Plumley, D. G., Elmwood School of Gardening, Cosham.
Spry, P. C. H., Thatcham Fruit and Flower Farm, Newbury.
Suhr, X. D., Studley College, Warwickshire.
Turner, R., 48 Cowley Street, Old Basford, Nottingham.

17. Baker, F., Parks Dept., Roath Park, Cardiff.
Barker, H. J., R.H.S. Gardens, Wisley, Surrey.
Tattersall, D., Strathmore, Streatham Common.

20. Hamling, R., Rodbaston Gardens, Penkridge, Staffs.
Maidment, H. F., The Gardens, Bishopstrow House, Warminster.
Wing, P., Studley College, Warwickshire.

23. Baxter, D., Sexey's School, Blackford, Wedmore.
Belshaw, D. K., Ragged Lands, Glynde, Sussex.
Bevington, F. de H., Horticultural College, Swanley.
Clarke, A. B., Horticultural College, Studley, Warwickshire.
Costin, F. W., Clemsford, Shenfield, Reading.
Penberthy, A. B., Claremont, Mottingham, Eltham.
Sharpe, F. M., Elmwood School of Gardening, Cosham.
Shillidy, M. S. A., Thatcham Fruit and Flower Farm, Newbury.
Wood, F. H. V., R.H.S. Gardens, Wisley, Ripley, Surrey.

32. Fisher, G., Studley College, Warwickshire.
Rowan, H. A., School of Gardening, Clapham, Worthing.
Taylor, P. F., School of Gardening, Clapham, Worthing.

Class III.

1. Breeze, M. S. G., Belle Vue, Broom Hill, Ipswich.
Hayward, K. M., Arlesey House, Arlesey, Beds.
Hosegood, D., Horticultural College, Swanley.
Hudson, C. E., 10 Fairfield Road, Chelmsford.
Owen, M. N., Bedford College, Regent's Park, W.
Trench, K. le Poer, St. James' Gardens, West Malvern.
Whiteley, A., R.H.S. Gardens, Wisley, Ripley, Surrey.

8. Croom, W. C., R.H.S. Gardens, Wisley, Ripley, Surrey.
Fleming, C. H., Horticultural College, Swanley.
Garrett, E. A., R.H.S. Gardens, Wisley, Ripley, Surrey.
Rudge, A. T., R.H.S. Gardens, Wisley, Ripley, Surrey.

12. Gilbert, H. J., The Gardens, Swettenham Hall, Congleton.
Moore, E. S., Ridgeway, Lordswood, Southampton.
Rolandi, M., Pightle, Letheringsett, Holt, Norfolk.
Stokes, F. E., Ven House Gardens, Milborne Port, Sherborne.

16. Bainbrigge, M., Manor House Gardens, Northfield, Birm.
Collett, D. E. T., Pightle, Letheringsett, Holt, Norfolk.
Edwards, L. C., R.H.S. Gardens, Wisley, Ripley, Surrey.

16. Hamilton, C. W., 19 Beaufort Gardens, London, S.W.
Hardy, E. M. Mc., Letheringsett, Holt, Norfolk.
Harland, M. L., Studley College, Warwickshire.
Martin, G. M., 6 Stone Road, Norwich.
Pettener, J. E., Schoolhouse, Winwick, Warrington.
Perkins, B., 8 Vale Street, Dennis Park, Stourbridge.

25. Box, G. D., Summercourt, Grampound Road, Cornwall.
Dean, A. T., 10 Priory Avenue, High Wycombe.
Dunsmore, G., Throstle Nest Gardens, Chellow Dene, Bradford.
Hiley, M. G., Elmswood School of Gardening, Cosham.
Johnson, G., Springfield, Ashleigh Avenue, Bridgwater.
Scott, T. W., The Gardens, Manderston, Berwickshire.
Wotherspoon, A., Broomrig, Dumfries, N.B.

32. Cuckney, E. J., R.H.S. Gardens, Wisley, Ripley, Surrey.
Dennis, K. M., St. James' Gardens, West Malvern.
Midwinter, A., Ragged Lands, Glynde, Sussex.
Moody, A. R., 28 Drake Street, Enfield, Middlesex.

36. Hill, R. B., 63 Egerton Road, Withington, Manchester.
Mercer, E. M., School of Gardening, Corstorphine, N.B.

38. Grant, N. C., Holly Bank, Hassocks.
Millen, L. D., School of Gardening, Corstorphine, N.B.
Owen, F., Maesgarnedd, Llanfair, Anglesea.
Pearce, B. C., Tincleton, nr. Dorchester.
Powell, J. W., New Road, Buckland, Surrey.
Wilson, C. W., 94 Nightingale Lane, Balham.

44. Cansfield, R. J., The Pightle, Letheringsett, Holt, Norfolk.
French, S., East Tolgus, Plainangwarry.
Hurst, L. C., Horticultural College, Swanley.
Streeter, W. H., R.H.S. Gardens, Wisley, Ripley, Surrey.

48. Johnson, E. M. G., Horticultural College, Swanley.
Joseph, H. C., School of Gardening, Clapham, Worthing.
Wheatley, J., Studley College, Warwickshire.
Williams, E., Horticultural College, Swanley.
Yeatman, B., Greenway Court, Hollingbourne.

53. Wightman, R., R.H.S. Gardens, Wisley, Ripley, Surrey.

54. Davidson, C. C., The Welcome, Feltwell, Norfolk.
Watson, J., Fairport, Ayr.

56. Arnold, C., R.H.S. Gardens, Wisley, Ripley, Surrey.
Cooper, N., 36 Maidstone Road, Rochester.
Greenway, P. J., R.H.S. Gardens, Wisley, Ripley, Surrey.
Kingston, H., 23 Winfield Street, Rugby.

60. Hobby, S. C., Crickett's Hill, Send, Woking.
Tjaarda, T., Horticultural College, Swanley.

62. Barrass, R. T., 1 Albany Terrace, Monkton.
Beazley, E. E., Ragged Lands, Glynde, Sussex.
Powell, A. H. A., John Innes Horticultural Institution, Merton.
Wallis, C., R.H.S. Gardens, Wisley, Ripley, Surrey.
Willmot, R. C., Roxwell, Chelmsford.

67. Debenham, L. V., Rectory Cottage, Ash, Wrotham.
Donnelly, M. J., 25 Cullingtree Road, Belfast.
Neal, J., Ivy Cottage, East Norton, Leicester.
Thorne, T. W., Gatton Park Gardens, Reigate.
Widdowson, W. H., Charnwood, Markfield.

72. Elst, J. van der, The Rest, Portslade, Sussex.
Harris, L. C., 80 Bedlam Lane, Rowley's Green.
Roose, E. W., Stanford Hall Gardens, Loughboro'.

75. Crutchley, E. H., Dunsley Rock, Stourbridge.
Lunn, C. W., Woodsome, Lees, Kirkburton.

77. Barnidge, J., 72 Victoria Terrace, Fox Road, Eastville.
Bryan, S., Lletty'r Dryw Cottage, Old Colwyn, North Wales.
Kay, J., Grangemuir Cottage, Prestwick, Ayrshire.
Newton, J., Muirend House Gardens, Cathcart, Glasgow.
Swan, J., South Park, Racecourse Road, Ayr.

82. Hill, G. R., 3 Mill Pit, Shiney Row, Fence Houses.
Kerr, M., Ragged Lands, Glynde, Sussex.

JUNIORS.

Class I.

1. Ratcliff, E., St. Kilda, Thaxted, Essex.
2. Barns, M. A., 16 Beverley Road, Highams Pk., Chingford.

Class II.

1. Lampard, W. H., Downside, Downs Lane, Leatherhead.
Morgan, L. E., Queen's Park, Crewe.

Class III.

1. Cox, K. M., 82 Debden Road, Saffron Walden.

2. Butler, E. J., White Oak School, Swanley.
Payne, C., Stoke Farm School, Bromsgrove.

4. Bird, S. A., 29 Warescote Road, Brentwood.
5. Baxter, J. P., Claremont, Park Road, Burslem.
6. Willoughby, E., 1 Augusta Villas, High Road, Loughton.

Class IV.

1. Hall, B., Stoke Farm School, Bromsgrove.
2. Wilson, C. K., Flounders Cottage, Hill Side, Moor Top.

3. Banner, J. R., Stoke Farm School, Bromsgrove.
Seaton, C. V., Stoke Farm School, Bromsgrove.

5. Ingle, G., Stoke Farm School, Bromsgrove.
Wilkinson, E., Industrial School, Lostock.

7. Jones, T. E., Stoke Farm School, Bromsgrove.
Juby, W., White Oak School, Swanley.
Raymond, T., Liverpool Farm School.
Reynolds, J., White Oak School, Swanley.

11. Bushnell, A., Kingswood Reformatory School.
Leece, W., Stoke Farm School, Bromsgrove.
Shillito, W. G., Industrial School, Lostock.

14. Bridge, W., Industrial School, Lostock.
Dunbar, W. R., Reformatory School, Stranraer.
Weymouth, J., Stoke Farm School, Bromsgrove.
Woodman, G. A., Stoke Farm School, Bromsgrove.

18. Hawkins, J., Chyreen, Rockingham Avenue, Romford.
Marshall, G., Stoke Farm School, Bromsgrove.
Poynter, A., White Oak School, Swanley.
Rogers, M., Chadwick Memorial School, Stanwix.
Shine, D. P. J., White Oak School, Swanley.

23. Harford, W. A., Liverpool Farm School.
Myatt, W., Stoke Farm School, Bromsgrove.
Tomlinson, J., Industrial School, Lostock.

EXAMINATION OF SCHOOL TEACHERS IN COTTAGE AND ALLOTMENT GARDENING.

APRIL 21, 1915.

FOUR HUNDRED AND EIGHTY-ONE candidates entered for the Examination of School Teachers in Cottage and Allotment Gardening held on April 21, 1915. Of these, 24 obtained a first class, 184 a second, and 238 a third, leaving 20 failures and 15 absentees.

The Examiners, Mr. F. J. Chittenden, F.L.S., Mr. John Fraser, F.L.S., Mr. W. Crump, V.M.H., and Mr. C. R. Fielder, V.M.H., report that the average number of marks earned was not quite as high as last year. This, together with the reduction in the number of candidates, is probably the effect of the war, its demands upon thought and time, and to enlistments in His Majesty's Forces.

The answers were of the usual variable quality. The majority of candidates showed a better knowledge of the cultivation of plants than of the treatment of fruit trees; and as for root-pruning, some would dig a trench *one foot* from the stem, whilst others would give manure to a tree which had been root-pruned because of its too luxuriant growth. The latter particularly lacks thought. The question on ridging and trenching was well answered; indeed, several of the answers were very good. Question 3 produced a few, but only a few carefully considered seed orders of fair average cost.

By recommending a weed-killer for dressing cultivated land to get rid of obnoxious weeds, candidates quite ignored the result upon subsequent crops. The answers on root and stem vegetables were collectively the worst, several failing to get any marks at all.

In Section B it appeared evident that candidates rely far too much upon acquired information stored up in their minds rather than upon a knowledge of principles, and the application of them to matters of everyday gardening. The answers were at fault not so much in actual errors as in serious omissions, and in the failure to apply elementary scientific facts to garden practice. Unless this be done these facts remain only "interesting" and of no practical value in horticulture, garden work remains "rule of thumb," and progress, hard to win in any case, is checked until it is almost or quite at a standstill.

As regards the style of answers, it must be added that there was generally perceptible a more methodical orderliness, rendering the work of marking easier and more intelligible, with a corresponding benefit to the candidates. Many lost time by being insufficiently concise and by not confining their answers strictly to the questions asked. Again, there were instances of candidates failing to comply with the request to commence each question on a fresh sheet of paper,

although the instruction is printed at the head of each sheet of foolscap. This results in much tiresome confusion in marking the answers which have to be distributed between the several Examiners and their assistant markers, and it may cause marks to be lost.

W. WILKS, *Secretary, R.H.S.*

Class I.

1. White, W. C., 46 Fredericks Road, Beccles.
2. Hall, W. D., 3 Church Street, Stapleford, Notts.
   Payne, T., 223 Bramford Road, Ipswich.
4. Bishop, A., Prestwood School, Great Missenden.
5. Hicks, R. W., 72 Nutgrove Road, St. Helens.
6. Thorn, E. C., Sunny Bank, Church St., Henley-on-Thames.
7. Haddock, J. H., 49 Chaplin Road, Wembley.
8. Atkinson, V. H., 153 Poppleton Road, York.
   Roughsedge, R. L., 18 Kimberley Drive, Stockton Heath.
   Vodrey, H. R., Enderby, The Fields, Alsager.
11. Caston, H. J., Schoolhouse, Redgrave, Diss.
12. Adams, J. T., Schoolhouse, Westbury, Salop.
   Cook, B., King's Road, Chingford.
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15. Barnham, W. G., 7 Ceres Road, Kingston-on-Thames.
16. Giles, J. S., Fowler Street, South Shields.
17. Fisher, W. H., 10 Longstone Road, Tooting Common.
   George, W. J., High Street, Cinderford.
   Williams, I., 17 Bettws Road, Brynmenin, Bridgend.
20. Evans, D. G., Schoolhouse, Fittleworth.
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   Leonard, W. J. S., 129 Walton Road, Aylesbury.
   Metcalf, S. G., Schoolhouse, Langar, Notts.
   Rawlings, A. D., Carrington, Boston.

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1. Bartlett, H. A. D., 85 Blenheim Road, Caversham.
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   Piper, J., 55 Whiteknights Rd., Reading.
6. Chapman, H. J., Schoolhouse, Barming.
   Davies, T. R., Rhydwilym, Clynderwen.
   Demer, H. H., Schoolhouse, Sherborne, Glos.
   Edwards, T. W., Riverside, Tir Phil, Glam.
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   Rushton, W. Eldwick, Bingley.

14. Dyer, T. M., 23 Gabalfa Road, Llandaff North.
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Smart, J. E., Kitwish, Heathfield, Sussex.

17. Baple, W. H., Schoolhouse, Exminster.
Haslam, J., The Yews, Crich, Matlock.
Terry, D. J., 18 Park Crescent, Bargoed.

20. Atkinson, M., King Street, Pelaw-on-Tyne.
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26. Channing, A., Schoolhouse, Newton Tracey.
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29. Bewley, W. F., Ingledene, North Crofts, Nantwich.
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Woolfall, M. E., Schoolhouse, Mapledurham.

36. Barratt, C. W., 93 Malvern Street, Stapenhill.
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Ramsden, F., 14 Lime Street, Accrington.
Williams, E., 71 Park Road, Bargoed.

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53. Aston, J. B., Schoolhouse, Blakeney, Norfolk.
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Hirons, H. J., 53 St. Dunstan's Crescent, Worcester.
62. Keast, A. E., Lymedale, Western Rd., Hurstpierpoint.
Knight, J. V., Shedfield, Grove Rd., Havant.
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73. Knight, G. A., Schoolhouse, Tugby, Leicester.
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Roden, N., Hathersage, Sheffield.
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83. Livesey, E. N., St. Leonards, Samlesbury, Lancs.
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Sweatman, W. J. H., 34 Blenheim Rd., Caversham.
Winder, H. H., 60 Red Lake, Ketley, Salop.
Woodman, O., 12 Griffith Street, Rushden.

Bickford, P. P., Little Saredon, Shareshill.
Coombes, W. J., Schoolhouse, Coalpit Heath.
Evans, R. W., Schoolhouse, Yarpole, Leominster.
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Keen, G., Schoolhouse, Fotheringay, Oundle.
MacCallum, H., Flowerfield, Lisburn.
92. McWilliams, H., The Limes, Rowington, Warwick.
Mallett, H. E. R., Roscoe, Ashburton.
Owen, J. A., Gwylfa, Everard Rd., Rhos, Colwyn Bay.
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104. Husbands, W., 5 Lonsdale Street, Bransty, Whitehaven.
Jackson, I., Barracks Fold, Hepworth.
Rimmer, G., Norton Canon, Weobley R.S.O.
Rogers, G. T., Eaton Holme, Overseal.

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Blackburn, E. M., 82 Kingsley Avenue, Kettering.
Chapman, C. H. V., The School, Elm Road, New Malden.
110. Conway, M. M., Moss End, Leatherhead.
Fuller, A. C., Schoolhouse, Fowlmere, Cambs.
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Pearson, R. A., Hipwood, Wistaston, Nantwich.
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Priest, N., Tealby, Lincoln.
118. Pryce, M., 11 Broad Street, Warwick.
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132. Rees, D., Wimborne Terrace, Pencoed.
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Stiles, J. B., 11 Holmer Road, Hereford.
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Tucker, J. H., Shipley, Hutton Grove, N. Finchley.
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Barnes, R. A., Ella Bank Road, Langley, Heanor.
146. Beevers, C. E., Street Lane, Gildersome.
Bradley, T. R., Chester Road, Whitby.

Burt, L. F., 12 St. George's Road, Coventry.
Cawthorn, J., 6 Lamb Park Terrace, Par, Cornwall.
Corris, T. C., St. John's Street, Wainfleet.
Cox, A., Turl's Hill Road, Sedgley.
149. Gilbart, J. W. H., Schoolhouse, Gulworthy, Tavistock.
Higgins, J. C., London Road, Markfield.
Jenkins, D. T., Schoolhouse, St. Nicholas, Cardiff.
Jones, I. G., Schoolhouse, Llangefni, Anglesey.
Jones, L. T., 67 Castle Street, Maesteg, Glam.

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Martin, A. F., 18 Dogsthorpe Road, Peterborough.
Meikle, J., 53 Wallace Street, Grangemouth.
149. Peppitt, G. F., Queen Street, Cubbington, Leamington.
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Russell, O., Schoolhouse, New Groombridge.
Wheeldon, T., 5 Regent Street, Oadby, Leicester.
Wood, J. C., The Banks, Bingham.

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Brandrick, W. J., Barton-under-Needwood, Burton.
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Burford, H. M., 27 Northlands Road, Moseley.
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166. Jenkins, J. A., 69 Brecon Road, Hirwain, Glam.
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Smith, W. H., School House, West Deeping, Peterborough.
Stackhouse, E., 63 Sutton Crescent, Walsall.
Winter, E. M., School House, Downham, Essex.
Wood, R. G., Fern Cottage, Wroughton, Wilts.

Class III.

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Hood, W. L., Rosslyn, Gravel Rd., South Farnborough.
Jepson, A. J., Schoolhouse, Fringford, Bicester.
1. Mitchell, A. J., King Edward's School, Witley, Surrey.
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Severn, E. H., Cosby Senior School, Leicester.
Smith, L. H., Crescent House, Romsey.
White, R. T., Friends' School, Sibford, Oxon.
Whitcombe, A. C. W., Fern Cottage, Wroughton, Wilts.
Woods, E. J., Montrose, Crescent Road, S. Woodford.

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Dring, G., Fairholm, Newmarket, Ashton-under-Lyne.
15. Fisher, A. W., 17 Front Street, Langley Park, Durham.
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Jackson, J. W., Congerstone, Atherstone.

Kilburn, J., St. Margaret's Schoolhouse, Durham.
Lloyd, J. L., Glyn, South Road, Aberystwyth.
15. Lowson, R. W., Tudor House, Walsall Road, Lichfield.
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Bowen, T., 18 Albert Rd., Mitcham, Surrey.
Cutler, H., Halesowen Street, Black Heath, Birmingham.
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Evans, O., Willow Cottage, Norton, Stourbridge.
Guest, F. E., South Hiendley, near Barnsley.
25. Jordan, A. V., Brewham School, Bruton.
Shepherd, C. H., Schoolhouse, Courtland Road, Wellington.
Simmons, H. B., 3 Wharfe View Villas, Wetherby.
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Bassett, W. F., Townsend, Braunton.
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Glegg, G., 5 Hessle View, Hyde Park, Leeds.
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Law, L. F., High Street, Cottenham.
35. Owen-Jones, J., Bryn Myfyr, Nebo, Llanrwst.
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46. Lane, A., 68 Castle Street, Battersea.
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Baker, L., Davidsholme, Yalding, Kent.
56. Barton, S., Schoolhouse, Sutton St. Edmund.
Griffith, W. J., Tegid House, Johnstown, Ruabon.
Hughes, E., Schoolhouse, Lewknor, Oxon.
Humphreys, L. V., Maesywaen County School, Bala.
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Ralph, J. A., Llandyssil, Montgomery.
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Wilson, J., Schoolhouse, Poulshot, Devizes.
Wood, L. B., 2 Aireville, Knottingley.

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Reading, E., Schoolhouse, Alcester.
Webster, J. I., Dayland Villa, Conisborough.
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106. Williams, F. J., 17 Park Road, Bargoed.
Wright, J., Holyoake House, Rushton Rd., Rothwell.
Coningham, J. P., Culverdene, Parkstone.
Daggett, E. C., Bridge Street, Stiffkey, Wells.
Firth, S., Croft View, Hightown, Liversedge.
Gratton, G. H. L., Rosslyn, Forest View, Woodford Green.
Horley, H., Drove Road, Biggleswade.
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118. Moule, D. J., 15 Belmont Road, Ilfracombe.
Oliver, J. S., Gable Cottage, Tiverton.
Owen, C. E., Bath Road, Sturminster Newton.
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132. Linnitt, C. F., 2 Cheltenham Villas, Devizes.
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150. Moffatt, J. H., 123 Ormerod Road, Burnley.
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Higgins, F. J. T., Collingbourne Kingston, Marlborough.
158. Palser, W. E., Walkworth Villa, Gloucester Rd., Cheltenham.
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Tucker, B., 30 Wern Crescent, Nelson.

158. Wilson, F., 17 Yew Tree Avenue, Carrington, Nottingham.
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166. Bailey, A. E., 66 Nansen Road, Sparkhill.
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Johnson, G. T., Vicarage Lodge, Yalding.
Morgan, S., Gwilym Road, Cwmllynfell, Swansea.
Quigley, J., 84 Manchuria Road, Clapham Common.
Roberts, A., Rempstone, Broad Street, Kingswinford.
Thomas, E. W., 8 Grove Terrace, Abercwmboi, Aberdare.

175. Collier, F. J., Centaur Road Schools, Coventry.
Elliott, R. C., Ingham, Norwich.
Norris, C., Thorpe St. Peter, Wainfleet, Lincs.
Newman, E. M., Westfield, Hook Road, Surbiton.

179. Coxon, W., Lyndhurst, Wrekenton, Gateshead.
Headford, H. R., 12 Poulton Terrace, Stanley, Co. Durham.
Jacquest, W. E., High Street, Finedon, Northants.
O'Brien, E., The Bungalow, Green Lane, Shepperton.
Randall, G. H., Oxford Villas, Ebley, Glos.
Stanford, E. A., 4 Leech Street, Longsight, Manchester.

185. Bradford, P. S., Northop House, South Hetton, Sunderland.
Clarke, C. F., 25 Whitepost Hill, Redhill.
Moody, T. J., 20 Alexandra Road, Hemel Hempstead.
Phillips, B., 18 Albert Road, Mitcham.
Plant, H. B., Cooksland House, Seighford, Stafford.
Rattenbury, W. A., 26 Park Parade, Harlesden, N.W.
Roberts, A. A., School House, Grange Moor, Wakefield.
Rood, A. H., 17 Gamlen Road, Putney, S.W.

193. Blake, P. J., 91 Queen's Road, Lowestoft.
Donelly, Mary J., 25 Cullingtree Road, Belfast.
Foster, S. J., Colley Elm, Southey, Wadsley Bridge, Sheffield.
Francis, P. A., Harborough Road, Desborough, Market Harboro'.
Owen, A., Council School, Cynwyd, Corwen.
Stancliffe, C. R., 2 Moorland Road, Fulford, York.
Vernon, W., Manor House, Ashton-u.-Hill, Tewkesbury.

200. Bates, G., Schoolhouse, Ballasalla, Isle of Man.
Jones, J. H., Bryn Haulog, Rhuddlan R.S.O., North Wales.
Kidd, A., 11 Wesley Street, Golden Hill, Stoke-on-Trent.
Lacy, W. B., 16 Grayham Road, New Malden, Surrey.
Lees, C., 38 Teddesley Street, Walsall.
Mountain, W. H. S., 25 White Post Hill, Redhill.
Wyatt, J. C., Union Lane, Shirley, nr. Birmingham.
Stephens, F. Z., 14 Denzil Road, Guildford.

208. Cutting, E. W., Post Office, Ockham, Woking.
Faulder, M. H., 76 New Bolsover, Chesterfield.

208. Lilley, Percy, 76 Westgate, Guisborough, Yorks.
Meager, W. E., 16 St. Winifred Road, Folkestone.

212. Croft, H. J. A., 32 Thornham New Road, Castleton, Man.
Llewelyn-Jones, S. A. A., Edendale, Appleby.
Kendall, F. G., Grange School, Alresford.
Morgan, J., 49 Endwell Road, Brockley, S.E.
White, E. H., High Lea, Hempstead, Saffron Walden.

217. Divine, A. F., 5 Woodcote Road, Wanstead, N.E.
Horton, W., Toynton All Saints School, near Spilsby.
Howitt, S., Benefield Road, Oundle.
Jacobs, G., 51 Crescent Road, Kidderminster.
McAllen, H. J. P., 5 Bankwell Road, Lee.
Murphy, A., Fulmodestone, Guist, Norfolk.

223. Bulmer, G., Stanley House, Bishopthorpe.
Cox, J., Earl's House Cottages, Durham.
Greenwood, N., 5 Healey Wood Bottom, Brighouse.
Jenkinson, J. H., Burnbank, Seaton.
Orbell, A. L., 14 Chester Terrace, Brighton.
Ramsden, B., 14 Lime Street, Accrington.
Redpath, R., 88 Castleford Road, Normanton.

230. Cobb, H. J., Sunny Terrace, West Stanley.
Mead, S., Wesleyan School, Robin Hood's Bay.
Robinson, C. J., Derbyshire View, Mottram.
Thompson, L. H., 80 Willow Avenue, Edgbaston.

234. Crust, A. L., Penn Cottage, Penn, High Wycombe.
Saunders, B., Birkenhead Waterworks, Corwen.

236. Davies, J. R. B., 14 Divinity Road, Oxford.
Hannaford, E. C., The Cottage, Kingsbury.
York, A., 19 Goodall Street, Walsall.

BOOK REVIEWS.

"Floral Rambles in Highways and Byways." By the Rev. Professor Henslow, M.A., F.L.S., F.G.S. 8vo. v + 294 pp. (S.P.C.K., London, 1915.) 6s. net.

The common (and some of the less common) British wild plants are described, with interesting notes upon them, in a series of chapters dealing with various plant habitats—such as "In the Water," "By Bogs, on Fenlands and Moors," and so on. The main idea developed all through the book is the author's well-known belief in the origin of plant-form through adaptation to environment, and he reiterates many of his ingenious suggestions as to the production of certain plant structures, at the same time discoursing interestingly upon propagation, distribution, and the like. Students who can also use one of the larger floras will find much suggestive illumination in this little book.

"The Handy Book on Pruning, Grafting, and Budding." By J. Udale. Ed. 3, 8vo. 146 pp. (W. H. Smith, Evesham.) 1*s.* 6*d.* net.

A comparison of the English and French systems of pruning recalls the contrast between the old and new ideas of education. The old school sought first to "break the spirit" of the pupil, and it is often much in this manner that our pruners set about their task. The Frenchman regards his tree as a pliable subject which can be educated. The Englishman sets about his task with a certain savage joy: one can almost hear the exclamation, "I'll learn you to make too much wood!"

We do not suggest that the author of the little book before us is animated by this spirit, but we cannot help thinking that he vastly underrates the importance of summer pruning in the yearly routine. While some hundred pages are devoted to winter pruning, summer pruning occupies but one-and-a-half pages. It is true that it is spoken of as an important operation; but it is not mentioned when dealing with the pruning of each fruit in detail. This book will not therefore, we fear, tend to modify the winter onslaught.

Another point which should be mentioned is the lack of some information on the physiology of trees in general. A clear notion of the respective importance of root-sap and leaf-sap will solve many doubts in the mind of the student, and we venture to suggest that such a chapter would be a valuable addition to a future edition.

So much by way of criticism. There now remains the more pleasant duty of pointing out the many excellent features of this work.

Upon the vexed question of pruning after planting or deferring this operation till the next winter, the author decides in favour of the first, stipulating that it shall be done just as the buds are breaking. On this question discussion has raged for many years, and will continue to do so until the disputants realize that they are not all dealing with the same thing. The Kentish fruit-grower thinking of his two-year apples on a free-rooting Paradise stock and his colleague in the West Country with his eight-year-old standard tree on Crab stock will quite naturally find themselves in opposite camps. The stock and the age of the tree are two important factors usually left out of consideration. In a footnote Mr. Udale makes an exception to his rule in the case of trees which have but little root, and these, he says, should be left unpruned till the winter after planting.

Most interesting are the illustrations of trees showing the growth made and the pruning necessary, and the frequent emphasis on the necessity of allowing sufficient light and air is, unfortunately, only too much needed. Useful figures are given of the shoots in detail, showing where and how the cut should be made, but our lack of definite terms for the various growths is a handicap which the author shares with all other English writers on this subject.

A chapter on Rose Pruning gives useful hints as to the treatment of the various classes, and the directions for Flowering Shrubs are largely culled from Baltet's work. The descriptions of Budding and Grafting are well illustrated, and should prove useful to beginners.

We are glad to see that this book has now reached its third edition, a testimony both to its value and to the need felt for a simple and reliable work on pruning, which it creditably fills.

" Fungoid Diseases of Farm and Garden Crops." By Thos. Milburn and E. A. Bessey. 8vo. xi + 118 pp. (Longmans, Green, London, 1915.) 2*s*. net.

The first thirty-eight pages of this little book are occupied by chapters on general matter; the remainder, except for four pages of index, with specific diseases of farm and garden crops, and farm animals. The " garden " crops are, however, only the crops grown in market gardens, not flowers or fruits or even the less common plants, and some such as celery which are quite common are omitted. The diseases which are dealt with are as a rule well dealt with, brief descriptions of the diseases, their causes, and the treatment appropriate to each particular case being given. Those growing these common plants will find the book very useful. We should have been better pleased to see " quicklime " recommended against finger-and-toe in turnips, rather than the indefinite " lime."

"An American Fruit Farm: its Selection, Management for Profit and Pleasure." By Francis Newton Thorpe. 8vo. 348 pp. (Putnam's Sons, New York.) $2.50 net.

The literature of the flower garden has long been under the sway of the amiable scribe, who, linking his arm in yours, gently leads you into his garden. There is no resisting this affectionate pressure, and for a short time flowers are all the subject of the discourse. But soon a horrid fear assails you: a fear that the garden is only a pretext, and that you are presently to act as an auditor to moralizings on every subject, from the right ordering of husbands and children to the exact position of Sologub in Russian literature.

In the fruit garden, however, comparative safety is found. Pomological authors have generally been of the downright sort who stick to the subject and leave the problems of the universe and the exhibition of their own culture to more suitable occasions. Upon opening the work now under consideration we see that the sanctuary has been invaded. The first chapter-heading alone awakens apprehension. "Time and the Tree!" A closer study shows this fear to be only too well founded, and an ambling pursuit of the obvious is carried on over some 342 pages. "Time seats the tree in dignity and power": "Yet Time is never weary and the tree is ever growing": these will serve as a sample of the author's quality in this direction. In the chapter on "Selecting a Farm" the author takes many pages to impress upon us that proximity to a market is desirable; and in his further remarks upon planting, cultivation, and the migration of the children from the old homestead the same detailed method is adopted.

There is much of interest in the work, particularly the author's account of the happy valley by Lake Erie where his farm is situated; but few there will be who have the time or inclination to disentangle formulæ for spraying from the scraps of Cato, Homer, and misquotations of Shakespeare among which they are embedded.

The book is well printed and illustrated with photographs of laden trees and cultural operations, and the last shows, we imagine, a portrait of the author seated on his verandah with his fruit lands stretching to Lake Erie, and two volumes, Cato and Homer we feel convinced, on a table conveniently to hand.

No longer can we feel sure that fruit books will deal only with fruits. With a sigh we turn from our former sanctuary and pass into the vegetable garden.

"The Well-considered Garden." By Mrs. Francis King. 8vo. 290 pp. (Scribner, New York. 1915.) $2.00 net.

Though this book is an embodiment, for American gardeners, of the practices of colour-scheming we generally associate with Miss Jekyll's writings, yet it has several points of attraction for English readers. It teaches us the present condition of gardening in the Northern United States; flatters our feelings by its evidences of how

closely the formal style of gardening, now popular among us, has caught on across the Atlantic; and perhaps astonishes us when we learn how great a use is made of our familiar garden plants in a country with such a rich flora of its own. It is a little disappointing to find so little local colouring in its pages, so few American plants mentioned, and such scanty hints of any work being done among them in the way of selection and adaptation to garden uses.

If the writer can be taken as an average sample of American amateur gardeners, we must conclude that they are even more painstaking and fastidious over their colour harmonies in the flower borders than we are. A trial garden for new-comers, and the banishment of yellow, orange, and scarlet flowers from the garden proper to the shrubbery borders, are evidences of this. On the other hand, the writer's delight in the mingling of such colours as the Prussian blue of *Scilla sibirica* with the deep purple of *Crocus vernus purpureus grandiflorus* strikes one as rather barbaric, but in the early spring days of much bare, brown soil, this may be exhilarating and not unpleasing to the eye. Her knowledge of Tulips seems far greater and more up-to-date than that of Daffodils, and yet by her way of writing of such varieties as *Narcissus Barrii conspicuus*, 'Sir Watkin,' and 'Minnie Hume,' she seems to be far ahead of her neighbours in having tried these regular old stagers.

The whole book is written in a pleasant and easy strain; every line breathes an air of the writer's personal contact with her plants, and a delight in their colours and the garden harmonies produced by their careful grouping for colour effect.

The chapter on gardening books is pleasant reading and again flattering to our feelings in the number of English books that are described and praised. A chapter headed "Various Gardens," devoted to descriptions of several fine American gardens, is perhaps the most generally interesting of all to English readers. Such a keen gardener as Mrs. King, writing of pleasures among plants that are so evidently real to her, in such a practical and cheerful way, should produce an influence for good and spread a love of beauty among many readers.

"Plant-Life." By C. A. Hall, F.R.M.S. 8vo. 380 pp. (Black, London, 1915.) 20*s*. net.

This large book contains 380 pages and 74 full-page illustrations, 50 being in colour, beautifully, accurately, and botanically drawn. The author tells us in the preface that he "has endeavoured to present his readers with a clear account of plant-life in its whole gamut, from the simplest microscopic forms to the most specialized flowering plants."

This, we think, he has very well done, but it leaves no room for larger questions than morphology demands. The following are the subjects of the twelve chapters: Asexual Plants; The Development of Sex, and Evolution; Seaweeds; Fungi and Lichens; The Arche-

goniates I.; The Archegoniates II.; Flowering Plants; Fossil Plants; The Food of Plants; Perpetuation of the Race; Defences; Ecology, and Index.

In every case good types are selected and described in a clear and instructive manner, admirably suited for a beginner in the study of botany.

Though the word "evolution" occurs in the second chapter (and *not* in the Index), it only refers to microscopic algæ.

With regard to cross- and self-fertilization, the author rightly emphasizes the mistake Darwin made in concluding from his experiments that the latter was injurious; but he misses the point of there being any special advantage in cross-pollination. It is now known that self-fertilizing plants are far more widely spread over the world and set far more seed than larger-flowered cross-pollinated plants. So that we must look for the true cause of the inferiority of cross-pollinated flowers. If the theory be true that insects are the "cause" of larger flowers as well as of "irregularity," then this enhancement of the non-essential whorls is done at the expense of the essential ones. Health and plenty of seeds are the two "ends" of plant-life; "improvements," in the gardener's eye, are of no account to plants. A small plant of the habitually self-fertilizing bittercress can bear 4,000 seeds and more.

Though he does not refer to the process of evolution under that word, he is right in echoing Warming's and Schimper's words in saying, "Given external conditions to act as stimuli, we may be assured that living protoplasm is fully capable of response, and that in Life itself there are potentialities which will lead to wonderful results"; such being the evolution of all plants, past, present, and future.

The author rightly applies this to the origin of spines and other so-called "defences" of plants, as the result of drought, and not for any useful purpose. If the spines of the rest-harrow to which he refers keep off rodents, so much the better, but its spineless ally is no more eaten than any other herb.

So, too, poison is no protection if caterpillars, which can feed on poisonous plants, attack them. Animals do not "instinctively" avoid all such, for cattle have often died from eating yew leaves.

Taking the book in its entirety, it is an admirably compiled exposition of the leading facts of structure, of a great and well-selected variety of plants. The text and the abundance of figures ought to make the book widely acceptable, though the price is of course heavy.

"The Study of Plants: An Introduction to Botany and Plant Ecology." By T. W. Woodhead, M.Sc., Ph.D., F.L.S. 8vo. 440 pp. (Clarendon Press, Oxford, 1915.) 5*s*. 6*d*.

This volume contains 440 pages and consists of five parts: i. Vegetative Organs; ii. Reproductive Organs; iii. Systematic Botany; iv. Common Trees and Shrubs; v. Ecology, to which ten chapters are devoted.

A few points seem to call for a little correction. Four "circumstances" promoting transpiration are mentioned but the most important—red and violet rays of light—are omitted. "Warm air" may induce *evaporation*, but transpiration is a function of light, whereas respiration is effected by heat. It is true that "respiration is a wasting process," but it should be added, it is the means in all organic beings of liberating energy, as for plant work (see 'Linn. Soc. Journ.' xxii. 81 and xxix. 288).

Twenty-seven examination papers, set at some of the principal colleges in the British Isles, conclude the volume.

"The course of work," writes the author, "followed in this book is directed in the main to the establishment of the fundamental principles of Plant Physiology. . . More space has been devoted to Ecology than is usual in an elementary text-book. . . . The subject-matter covers the work necessary for"—the examinations referred to. Lastly it contains 257 excellent photos and text-figures, as well as a copious index.

In one respect the book is *too good*, for many young people (unless they are properly trained *to observe living plant-structures*) will be tempted to "get up" their botany from this book alone. We have gone through all the questions in the twenty-seven papers, and rarely find one which cannot be answered out of this excellent manual.

But to be "too good" for the few would be no reason for eliminating a single line for the many. If there is a weak point desirable to point out, it is one commonly found in modern text-books which introduce *Ecology*; namely, that while admirably describing the correlations of plant-structures adapted to the external phenomena of plant associations, the writers *suddenly stop short of the most important and obvious inference*, which we will give in the words of our two great ecologists, Schimper and Warming. The former says: "The change [of existing floras] is due. . . to a transformation of the plants . . . their structure is subject to a process of metamorphosis . . . being rapidly modified by changes in the environment . . . constituting the 'adaptations' in which the external factors *acting on* the plants are reflected." This agrees with Darwin's statement that the "direct action of changed conditions of life produces 'definite' variations, without the aid of natural selection." Schimper, then, concludes his paragraph: "The investigation of these *causes* of differences . . . is to be numbered among the chief duties of geographical botany" (Preface to "Plant-Geography" &c.).

Dr. Warming strongly corroborates this view: "It is beyond doubt that characters peculiar to growth-forms have arisen through direct adaptation to the environment, . . . and these acquired characters have been fixed by heredity" ("Œcology," p. 373). Our author, in describing the "Work of the Root," alludes to external "stimuli," observing they "are important factors in the environment of a plant; and, as they vary frequently, it is necessary for the plant to respond and adjust

itself to the changing conditions. The power of response and adjustment is the most characteristic feature of *Life*."

He applies this to the root only: but it is equally applicable to *every organ of a plant*, both *morphologically*, as seen externally, and *anatomically*, within.

The University of Cambridge puts it in a question on Ecology: "Mention any characters of the plants selected [previously mentioned] which you might regard *as developed in relation to* their respective habitats." The words we have italicized refer generally to all parts of all plants characteristic of well-defined associations, as Xerophytes, Hydrophytes, &c. "The Study of Plants" can scarcely answer this question in full.

"The Mutation Factor in Evolution, with Particular Reference to Oenothera." By R. Ruggles Gates, Ph.D., F.L.S. 8vo. xvi + 353 pp. (Macmillan, London, 1915.) 10s. net.

Everyone recognizes the fact of heredity, but its mechanism is little understood. Mendel's work threw a little light upon it and acted as a guide to further investigation, but full knowledge is not yet. Still less is the origin of the variations which give rise to new forms understood. Some look to the direct action of the environment, some to crossing, some to mutation, some to inherent variability; the author deals with the *rôle* of mutation. Mutations he regards as the expression of some germinal change, the origin of which is, however, a mystery. The results of his work lead him to conclude that mutations occur quite apart from crossing either in the preceding generation or in any preceding generation, and he examines the evidence for this view, much of which has been accumulated by his own energy, and which relates largely to the forms of *Oenothera Lamarckiana* upon which de Vries built his Mutation Theory. He has produced a masterly review of our knowledge of the matter, and withal a readable one. Many of his results appear at variance with Mendelian expectations, and they raise interesting and important questions for those who believe all problems of genetics may be solved by the application of the idea of unit characters. The case of peas which Mendel investigated was comparatively simple, though less simple than at first appeared, for many difficult problems have arisen since the repetition of his experiments began, and other plants are proving less amenable to the formulæ which have been derived at present.

"The Hobby Gardener." By A. C. Marshall, F.R.H.S. 8vo. 119 pp. (Pearson, London, 1915.) 1s. net.

Written for the owners of small or villa gardens. The author has kept enthusiastic gardeners always in mind by writing his instructions plainly, with capital explanatory diagrams, and giving clear suggestions of what should be done month by month to keep the garden attractive, and to develop the healthy hobby of the owner. The book is nicely printed, and possesses a good index.

"Every Woman's Flower Garden." By Mary Hampden. 8vo. 353 pp. (Jenkins, London, 1915.) 5*s.* net.

A well-printed, well-illustrated, and well-written book for women possessing a garden. Although we do not admire the designs of beds and borders in all cases, that is a matter of taste, and many would no doubt praise what we consider somewhat objectionable. As ladies are now amongst the principal supporters of gardening in this country, this book will appeal to them, and they will be able to glean many useful ideas from it that may be adapted to their own gardens. The process of deep digging and liberal manuring, thus giving greater root room with ample plant food, is ably dealt with by the authoress, and we specially commend this chapter to readers, as it is the foundation of success.

"My Villa Garden." By S. Graveson. 8vo. 124 pp. (Headley, London, 1915.) 2*s.* 6*d.* net.

This is a most attractive and useful book, beautifully illustrated, boldly printed, full of information, and written in a charming style. The author evidently knows what he is writing about, as proved by the excellent plants and bulbs named in the book, which, unfortunately, is not indexed. We were very glad to see reference to the alpine house; when we remember what a host of gems can be grown to perfection without fire heat, it is very strange that more people do not have the delight of such a house.

"The Book of Hardy Flowers." By H. H. Thomas. 8vo. 492 pp. (Cassell, London, 1915.) 12*s.* 6*d.* net.

A very useful book, arranged in alphabetical order, and in most cases giving the botanical and the common name, which many will consider a boon. The best methods of culture, and the most suitable soils and positions, are given for each kind of plant. We notice the word "kinds" is used in some instances instead of "varieties," and the word Chile is spelt Chili; however, these are small matters that may be corrected in a future edition. The whole book is admirably written, with excellent illustrations, especially the smaller ones, which are remarkably clear. All classes of plants are clearly described, including alpine, herbaceous, biennial, annual, bog, aquatic, and bulbous plants, with instructions as to propagation &c. There are about 30 coloured plates, and a great number of half-tone illustrations and sketches, and the book finishes with a list of popular names, with the botanical name opposite.

"The Principles of Fruit-growing." By L. H. Bailey. 8vo. 432 pp. (Macmillan, London and New York, 1915.) 7*s.* 6*d.* net.

There are few books on horticulture that run into the twentieth edition in less than twenty years, the first edition having been published in 1897. Since then much fresh knowledge has come to the aid of

the fruit-grower. The author has rearranged, reset, and largely rewritten the present edition, and it embodies the most up-to-date knowledge of fruit culture, and the enemies the fruit-grower must contend with, of any book we have seen. Although written, perhaps, more for the American than the British grower, "The Principles of Fruit-growing" had already become an indispensable standard work in this country, and good as the earlier editions have been the present edition eclipses them all. Obviously many of the kinds and varieties of fruit advised to be grown would be quite out of the question in this country; it is more particularly to the sound advice he gives on the general management of fruit trees that we desire to call attention. We can only say it is excellent, and ought to be read carefully by every grower of fruit in private and market establishments in the country. The author seems doubtful about the benefits of dwarf or bush apples and pears, and states that "as a general thing the standards are the safer and more reliable"; this may be true of trees in America, but in this country the bush or dwarf trees are undoubtedly the best, given the cultural attention suggested by Mr. Bailey. The subjects of pruning, manuring, spraying, grading the fruit, grafting, insect and fungoid pests, &c., are all ably treated upon, and sound, concise advice given; in fact, there is so much valuable information in the book that we again advise everyone to read it. A very accurate index adds to the value of the work.

"Principles of Horticulture." By Edward A. White. 8vo. 467 pp. (Macmillan, London and New York, 1915.) Price 7*s*. 6*d*. net.

The author, who is Professor of Floriculture in the New York State College of Agriculture at Cornell University, is to be complimented on the work before us. Not only is it a very welcome departure from the mass of books on gardening now issued, but it is also compiled in a very instructive style. Though written for American readers, it contains a vast amount of information valuable for British readers. Some of the matter is not suited for practice in this country, as the methods of growing are different in America and Britain; for instance, roses, carnations, and many other flowers are grown on benches in beds of soil, instead of in pots as in this country, and admirably they succeed in the U.S.A., because no doubt they get infinitely more light in winter than we do. On page 52 the author says, "it is essential that uneven-span houses run east and west." This may be good advice there, but in this country such greenhouses are run north and south so that one side gets as much light as the other. Heating by steam seems to be favoured by Mr. White, but it has never become popular in this country.

The growing of flowers, including orchids, for market is excellently dealt with, with brief but clear references to cultivation, temperature, compost, insect attacks, diseases, packing, construction of houses for

market purposes &c.; and, as already stated, although much of the instruction given is not applicable in this country, there is much that is.

"Chinese Forest Trees and Timber Supply." By Norman Shaw, B.A. 8vo., 351 pp. With a map and 33 illustrations. (Unwin, London, 1914.) 10s. 6*d.* net.

Mr. Shaw is fortunate in his subject. Of late years, since the work of Hance, of Dr. Henry, and of Mr. E. H. Wilson, there is no country to which the botanist and horticulturist look with more interest than to China. There have been for half a century speculations as to an eastward retreat of the European "Miocene" flora before the cold of the Glacial Epoch; but the work of these collectors has demonstrated that China is the headquarters of many genera of the North Temperate zone, just as eastern North America is of *Crataegus* and *Acer.* While the botanist is equally interested in new species of *Viburnum*, *Hydrangea*, *Primula*, or *Meconopsis*, the business man is ransacking the globe for prospective sources of a timber supply to make up for the excess of consumption over production in most of the previously known regions.

So great, then, is the interest of his subject-matter that we can overlook sundry little defects of literary style in Mr. Shaw's presentation of his results. His work is divided into two widely disparate Parts, the first dealing with "The Forest Problem in China," the second entitled "Notes on Chinese Forest Trees." So slight is the knowledge we most of us have of Chinese geography, and of other matters Chinese, that it is to be regretted that the one map in the volume is but a mere sketch of the distribution of population and forests, without indication of the division into provinces; and also that various native words for measures, prices, &c. are left unexplained. One would also have preferred that the trees named in the first Part had been more precisely identified, or that references had been given to the descriptions in Part II. At the same time we know of no one work in which so full an account of the forests of the whole of China, and of their constituent species, can be obtained.

The story, down to recent times, is almost everywhere the same—a love of trees near their homes on the part of the people, but reckless felling on the "no-man's-land" of the mountains; forest fires started by hunters to drive out game, by fire-balloons on the Feast of Lanterns, and other foolish causes; and no attempt whatever at re-afforestation. The officials, says a Consular Report quoted by Mr. Shaw, are not ignorant of such truisms as that destruction of forests leads to floods, followed by a drying-up of springs, "and from time to time put out posters exhorting the people to plant pines and firs and to abstain from setting fire to the hillsides. Seeds even are offered gratuitously. But surveillance is wanting." There are, however, signs of improvement. German example at Tsingtau and the influence of Russian,

Japanese, and Philippine teaching have not been altogether lost. A forest school was established at Mukden in 1907, and a foreign adviser to the Bureau of Forestry was appointed in 1913; so that it may not be altogether too late to remedy past waste.

In Part II. a few little slips, such as *Holoxylon amnodendron* for *Haloxylon ammodendron*, the styling *Biota orientalis* and *Cupressus thyoides* "varieties," and the statement that *Ginkgo* "represents the sole link between trees and ferns now surviving," show that the author is not a botanist; but he has made most intelligent use of the work of those who have preceded him, of which he gives a useful bibliograpby; and the net result is an interesting and useful book.

"Bulbs and their Cultivation." By T. W. Sanders. Ed. 2. 8vo. 198 pp. (Collingridge, London, 1915.) 2*s.* 6*d.* net.

A very practical treatise on the cultivation of bulbs both under glass and outside; tuberous-rooted plants are also included. The best varieties, storage, propagation, pests, and diseases are all ably treated of, and manures have not been forgotten. Printing and illustrations are good, and a capital index completes the book.

"Rock Gardens and Alpine Plants, including Water, Bog, and Moraine Gardens." By T. W. Sanders. 8vo., 206 pp. (Collingridge, London, 1915.) 3*s.* 6*d.* net.

There are many books on the above subject, but still room for the present one, as it is written in such a concise and clear form that the whole subject is plain to one beginning to take up this fascinating phase of gardening. The chapter on the construction of rock-gardens is well worth the study of all readers and contains much sound advice; in fact, sound practical information is a great feature of the whole book, and we hope all lovers of this class of plants will read it. There is a very good index.

"Citrus Fruits." By J. Eliot Coit, M.S.A., Ph.D., Professor of Citriculture in the University of California. xx + 520 pp., illustrated. (The Macmillan Co., New York, 1915.) 8*s.* 6*d.* net.

This addition to the 'Rural Science Series' treats of the cultivation and marketing of oranges and lemons and kindred fruits of the Citrus family, with special reference to practices and climatic conditions obtaining in California and Florida. In both these States the Citrus industry has attained an important position and is progressing rapidly, and the methods of cultivation adopted and the business-like organization of the industry are characteristically American.

Hitherto the literature relating to the industry has been scattered through a large number of periodicals and reports, as is indicated by the extensive bibliography appended to this volume, and the aim of the author has been to select and bring together the more valuable parts of this information and to describe the industry as it

exists to-day. Citrus trees are said to have been introduced by the Spaniards into their South American possessions at a very early date, and were taken thence to California by missionaries and pioneers of Spanish descent early in the eighteenth century. The original orchards are still standing, in some cases, on the sites of the old mission stations. The modern Citrus industry is peculiar amongst horticultural industries in that it has been built up almost entirely by individuals who were professional or business men broken in health in following their pursuits in cities, and who sought an open-air life in the dry atmosphere and sunshine of California and Florida in order to find rest and to recuperate. These men brought to the industry the necessary capital, and, what was equally valuable, commercial habits and business ability, and to these is largely due the success and importance to which the industry has attained at the present time. Another factor tending towards success has been the protective duty imposed upon Citrus imports by the United States Congress. Further, the United States Government has helped by carrying out scientific investigations, by disseminating information by means of free lectures and pamphlets, and by operating free demonstration trains on the railroads. Agricultural and Horticultural Societies and Chambers of Commerce have likewise lent their aid. Commencing with the history of the industry and giving an account of the introduction and development of the famous Washington navel orange, the book treats of the botany of the subject and describes the numerous varieties and forms of Citrus fruits; this is followed by chapters or sections on nursery culture, breeding, judging, planting, cultivation and fertilization of Citrus orchards, irrigation, pruning, orchard-heating against frosts, picking, packing and marketing, by-products of the Citrus industry, orchard pests and diseases and their control. Much of this information is of practical use only in California, but growers of fruit in this country might with advantage read the chapters on orchard-heating, the control of diseases and pests, and the splendid organization of the industry, the latter almost absent amongst fruit farmers in this country. The book is well printed and illustrated; there are a few slips of the pen, as in the case on page 4, where a well-known nurseryman of this country is referred to as Sir Thomas Rivers.

"A School Flora." By W. M. Watts. New ed. 8vo. viii + 208 pp. (Longmans, London, 1915.) 3*s.* 6*d.*

When first published in 1887, this book was intended as a "key" for the botanical classes at the Giggleswick School, but it soon found a wider public, and its second enlargement to include the rarer plants growing in the neighbourhood of most of the other big public schools will still further extend its sphere of usefulness. There is probably no better "key" to ascertain the names of the wild plants of Britain than this, and the book needs no other encomium beyond the fact of a further edition being called for.

"A First Book of School Gardening." By A. Logan. 8vo. vii + 151 pp. (Macmillan, London, 1915.) 1*s.* 6*d.* net.

We like the plan of this book. An exercise is given, and the way to do it indicated; then a discussion of its particular and general bearings follows, and finally exercises in writing notes and comments upon it. The author has grasped an excellent method of teaching school gardening so as obtain much of its really educational value. One may not agree with quite all the author suggests: *e.g.*, his diction is perhaps a little difficult at times for school children of eleven or twelve, and the introduction of sécateurs is perhaps not wise, for there is no tool capable of doing more harm if not kept in first-class order—and they are not easy to keep in order—but the book is certainly one of the best with which we have met, from a teaching point of view.

"Plant-Breeding." By L. H. Bailey and A. W. Gilbert. Revised edition. 8vo. xviii + 474 pp. (Macmillan Co., New York, 1915.) 8*s.* 6*d.* net.

Many of us remember with pleasure the inspiring text Professor L. H. Bailey gave us upon "Plant-Breeding" in the first edition of this book, published in 1895. Our knowledge of the subject has grown by leaps and bounds since then, and the need for a thorough revision has become paramount. This revision has been entrusted to Professor Gilbert, and though one misses the touch of Professor Bailey's hand, his collaborator has produced a reliable text bringing up to date the various methods now in vogue of studying plant-breeding from a variety of angles.

The author considers the facts of variation, and the causes of it, apparently accepting *among others* the action of environment, which may have, he believes, either an immediate or a cumulative effect upon the offspring. The methods and aims of purposeful selection, the measurement of variation, mutations, hybridization, heredity, the origin of domestic varieties, practical plant-breeding, and an account of the concerted efforts now being made in the States to forward plant-breeding, are all discussed. A needed glossary of terms, including one or two new ones ("plateation"—a physiological variation caused by external influences, such as locality, climate, soil, and so forth, sometimes called "place-variation"—one of the three kinds of variation: fluctuation, mutation, and plateation), and an extensive bibliography, followed by a series of practical exercises, complete a very useful text-book for the use of college students.

"The Cherries of New York." By U. P. Hedrick. Being the Report of the New York Experimental Station for 1914. 4to. 371 pp.

The valuable series of monographs which Mr. Hedrick and his assistants are producing are well known to British pomologists, and the volume on cherries which has just reached this country will be cordially welcomed.

The general arrangement of the work follows closely that of the preceding volumes. The species of *Cerasus* are first described and an account of their geographical distribution is given.

The history of the cherry and cultural matters, such as stocks for grafting &c., follow, and the important descriptions of varieties make up the bulk of the work.

The species of *Cerasus* are illustrated by flowering shoots in which the young leaves are but slightly expanded, and we think a young shoot showing the characteristic leaf shape and pose would have been useful to students, as leaf characters can be observed over a long period.

In discussing *P. Avium* the author gives its height at 30 to 40 feet. This must, we presume, refer to its growth in the United States, as in this country many trees are known of 90 feet in height, and the average stature of a fully-grown tree would be about 60 feet. He also says that "*P. Avium* suckers little or not at all." This is, we think, incorrect. In Britain cherries are so much grown on grass that suckers are grazed off or killed by the grass as soon as they appear, but in woods large colonies of young plants may be found around old trees.

The chapters devoted to cultural matters will repay careful perusal, especially that on stocks. It is interesting to note that 95 per cent. of the cherries grown in the States are worked on the Mahaleb.

The subject of pollination is briefly dealt with, as the author deduces from the behaviour of isolated trees that the cherry is the most nearly self-fertile of all fruit trees. This opinion, and the fact that cherries that are sterile in Oregon are perfectly self-fertile in the New York State, should give pause to those who treat pollination as the main factor in fruit production.

The chief interest of the work lies in the systematic descriptions of varieties, and these are done in the most detailed manner. The botanical characters, the individual habits, and the commercial value of each are discussed at length. The historical notes are extremely interesting, though in some cases we cannot always agree with the author. It is, for instance, very doubtful if 'Tradescant's Cherry,' or 'Elkhorn,' as it is called in America, was raised by Tradescant himself. It is far more likely to be a Continental variety, found by him on his travels. We also note that the author has not considered this fruit as identical with 'Noble,' a fruit of recent introduction, but which is without doubt the 'St. Margaret's' or 'Tradescant's Cherry' rechristened.

For 'Ludwig's Bigarreau' the origin is incorrectly stated, the author being probably misled by Leroy, who in his "Dictionnaire de Pomologie," quotes from "The Florist and Pomologist" "obtenue de semis . . . par Thomas Rivers." A reference, however, to the original text shows that this is a mistranslation for "introduced by T. Rivers." The real source of this cherry is apparently unrecorded by any pomologist.

The cherry 'Belle de Magnifique,' whose origin has provided a problem to many pomologists, is described as "brought to notice by Chatenay." André Leroy, however, considered it identical with the 'Griotte commune,' a variety of great antiquity. The latter Prof. Hedrick describes separately, but makes no mention of the similarity. The bibliography which is given is fairly complete, but we are surprised to find Thompson's excellent monograph of the cherry published in the R.H.S. Transactions, Series II., vol. i., is omitted.

The work of Aehrenthal, "Deutschlands Kernobstsorten," with its excellent illustrations of cherries, was not apparently available, and the modern "Deutschlands Obstsorten," with its valuable photographs of trees in winter state, might profitably have been referred to.

These omissions, however, do not detract from the value of a very useful work, which will doubtless remain the standard book upon the subject. Happy are the people whose Government provides them with such valuable information, and happier those in this country who benefit by such generosity.

"Field Book of American Trees and Shrubs: a concise description of the character and colour of species common throughout the United States, together with maps showing their general distribution." By F. Schuyler Mathews. With numerous reproductions of water-colour, crayon, and pen-and-ink studies from nature by the author. 8vo. xvii + 465 pp. (Putnams, New York and London, 1915.) $2 net.

One of the most striking facts in the geographical distribution of plants is the great specific variety of arborescent forms in eastern North America. Mr. Mathews, for instance, describes 22 species of *Pinus*, 4 of Larch, 8 of Spruce, 8 of *Abies*, 4 of *Tsuga*, 10 forms of *Juniperus*, more than 30 Willows, 12 Poplars, 9 Hickories, 10 Birches, 6 Alders, 22 Oaks, 7 Elms, 11 species of *Pyrus*, 9 of *Amelanchier*, 61 of *Crataegus*, 16 of *Prunus*, 9 each of *Ilex*, *Acer*, and *Cornus*, 8 of Ash, and 16 of *Viburnum*.

To have done justice to so extensive a tree-flora in the compass of a really pocketable volume is no mean achievement. Two or three species are generally described on a page; but height, habit, bark, diameter of stem, leaves, flowers, fruit, wood, habitat, distribution, enemies, and uses are all succinctly treated. A key to the species by leaf-characters is given at the beginning of the book with a page of excellent diagrams of leaf-form, and a key by bark characters, of which 18 types are illustrated at the end. The copious illustrations are a marked feature of the book. We do not think the 16 coloured and 50 crayon drawings of the trees do much to convey any useful notion of their habits; but the 124 pages of pen-and-ink sketches of details of cones, needles, leaves, flowers, and fruits, illustrating five or six species on a page, are admirable. In addition to sketch maps of the altitudes, geology, soil, and isotherms of the United States, there are no less than 70 distributional maps, showing the areas occupied by about 270 species. A good index completes what is altogether a remarkably good book.

"The Spirit of the Soil." By G. D. Knox. 8vo. xiii + 242 pp (Constable, London, 1915.) 2*s.* 6*d.* net.

We have enjoyed reading this book immensely. It is "an account of the nitrogen fixation in the soil by bacteria and of the production of auximones as promoted by bacterized peat," and a foreword by Prof. Bottomley, the originator of bacterized peat or "humogen," tells us that he takes full responsibility for the statements contained in the book. It puts the case for bacterized peat in a fashion worthy of the effort of an eminent Counsel determined to obtain a verdict for his client, and withal convinced of the rightness of his cause. It has all the merits and all the faults inseparable from good special pleading, and it deals in a lucid and readable manner with many aspects of the subject, which often branches off into difficult and technical matters. We hope that the book will be widely read, and that its readers will suspend judgment until they have secured some of the peat and tried it carefully outdoors themselves, taking care to avoid the errors into which some of those whose success is reported have apparently fallen in making their experiments.

We wish the author were a horticulturist—we think he cannot be, or he would have avoided such names as Cordyline Dracena, Brussel Sprouts, Balsam Impatiens, Veitchii Calanthe, and the like—and he would then, with his evident scientific knowledge and clear grasp of scientific methods, have been able the better to see the many pitfalls into which experimenters with living plants, especially in the open ground, may fall.

We have referred in another place to the value of bacterized peat, and need do no more than state here that not all the results have been so favourable to the use of "humogen" as have most of those to which the author refers. We cannot, however, refrain from quoting one experiment which is relied upon to show the value of bacterized peat. It is on p. 146. Four potatos were put into a box 15½ inches by 6 inches by 4 inches, containing sterilized moss. This moss was first soaked in humogen extract and the plants were watered from time to time with the same (nothing is said of the quantity used, the original weight of the tubers, the result of growing four tubers of the same variety and weight in sterilized moss merely watered with a weak solution of earth salts). At the end of some time (not stated) the tubers were taken out and weighed, the total produce being 2 lb. 10½ oz. Now, surely there is nothing remarkable in this. The space was small truly, but if one compares the yield with that obtained from four tubers grown in ordinary good soil one cannot but be struck with its smallness. In the Wisley trials, *e.g.*, reported on pp. 292–304, weights obtained from 20 tubers of each of many varieties may be compared with profit. Bacterized peat may well prove to be a valuable manure, but "experiments" such as this will surely not convince any thinking horticulturist, though to see a box packed with many potatos "all grown from four" may be an exciting spectacle for the uninitiated.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

The Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of giving references to papers, as the observance of an identical *order* renders subsequent reference to the original easy. The order is as follows:—

1. To place first the name of the plant, disease, pest, &c., being noticed; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 367, 368.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP IN THIS WORK.

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Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales . .	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope . .	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort. .	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg . . .	Ann. Jard. Bot. Buit.
Annals of Applied Biology.	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton.	Ann. Rep. Agr. Res. Stn. Long Ashton.
Beiheft zum Botanischen Centralblatt . .	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d' Orticultura.	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France .	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret . . .	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France . .	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane . .	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne .	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica .	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations .	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium . .	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria . . .	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand .	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées . .	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society . .	Jour. R.A.S.
Journal of the Society of Chemical Industry .	Jour. Soc. Chem. Ind.

Journal S.E. Agricultural College, Wye . .	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst . .	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society .	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal . . .	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia .	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden . .	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh . . .	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc. .	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc. .	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc. .	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins .	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports . .	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications .	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report . . .	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Alpines in Winter, Protection of. By Craiglea (*Garden*, Jan. 17, 1914, p. 31).—The author has found a satisfactory method of protection to consist in scattering gravelly matter round the most precious plants, and wedging small stones round the necks of the plants, so as to keep the neck erect. The object is to keep the foliage off the ground. The method has been found effective with *Saxifraga Griesbachii* and *S. Stribrnyi*.—*H. R. D.*

Apple and Pear Juices, Composition of Vintage. By B. T. P. Barker and O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 41–55).—The specific gravity, sugar content, malic acid, tannin content, and rate of fermentation of a large number of varieties of cider apples and perry pears are given. Apples from trees on Paradise stock show lower acidities than those of the same variety on free stock, but differences in specific gravity and tannin are not so pronounced.—*F. J. C.*

Apple, The Powdery Mildew of, and its Control in the Pajaro Valley. By W. S. Ballard and W. H. Volck (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 120, Sept. 1914, pp. 1–26; 6 plates, 5 figs.).—Powdery mildew of the apple (*Podosphaera leucotricha* (E. and E.) Salm.) is widely distributed over the world, and considerable loss has occurred in apple-growing districts of California owing to its ravages. The mildew most frequently attacks the foliage and the shoots, rarely the fruit, and forms greyish-white areas on the under-surface of the leaves. These mildew areas may extend down the petiole and form a complete felted mass enclosing the entire shoot. The fungus produces conidia and perithecia. No varieties of apples grown in the Pajaro Valley are immune, but some are much less affected than others. The most susceptible are 'Yellow Newtown,' 'Yellow Bellflower,' 'Smith's Cider,' 'Missouri Pippin,' 'Esopus,' and 'Gravenstein,' while such varieties as 'White Pearmain,' 'Winter Pearmain,' 'Rhode Island Greening,' and 'Langford' are less severely attacked by the disease.

To control the disease, systematic spraying with iron-sulphur mixture and winter pruning of the trees are recommended.—*A. B.*

Apples, A Spot Disease of. By B. T. P. Barker (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 97–99).—A superficial brown spotting of apples somewhat similar to bitter pit, but only skin-deep, was particularly prevalent last year, in various parts of the country. The spots were usually associated with lenticels, but, though a fungus was present, cultures showed the fungus to be not always the same.—*F. J. C.*

Arnebia echioides: The Prophet Flower. By C. Q. (*Garden*, Jan. 10, 1914, p. 18, and fig.)—This belongs to the family Boragineae, and is allied to *Lithospermum*. This species is remarkable for its singular flowers; these are primrose yellow, with a purple, almost black, spot on the lobes of the corolla. The curious thing is that the dark spot gradually disappears in a few days. The author speculates on the reason for this. Many flowers of Boragineae in the course of development seem to recapitulate the evolution of their colours, and the colour change in *Arnebia echioides* may be due to this cause. But the spots only disappear as the flowers age, and it seems more probable that it may be an adaptation to show insects which are the pollinated and which the useful and unpollinated flowers. Difficulty is sometimes found in increasing stock of this plant; it may be done by taking cuttings of strong roots or by seed.

Arnebia cornuta (*ib.* Feb. 7, 1914, p. 66).—This is an interesting annual, though seldom seen. Its flowers are rich yellow, marked with large heart-shaped black spots from the base to the tip of the petals. These on the second day turn to a deep maroon, and finally disappear with age, leaving pure yellow flowers.

H. R. D.

Asters, "Black Neck" or Wilt Disease of. By W. Robinson (*Ann. Appl. Biol.* ii., July 1915, pp. 125–137; plates).—This disease, characterized by the sudden death and wilting of the plants, is too well known. It has been attributed to a variety of causes, especially to the attack of a little white worm (*Enchytraeus parvulus*), and to species of *Fusarium* (including *F. incarnatum*). The author finds, however, a *Phytophthora* (unnamed) always associated with the disease and capable of producing it when inoculated into seedling and mature plants, the lesions produced being in every way similar to those seen in infected plants in the garden. The characters of the fungus are somewhat peculiar, and will be found in detail in the paper. The "aster" referred to is, of course, the German or China Aster (*Callistephus hortensis*).—*F. J. C.*

Bambusa polymorpha (*Rev. Hort.* Feb. 16, 1915, p. 386).—All specimens of this species flowered simultaneously in 1914 after a non-flowering period of fifty-four years, which appears to be the usual term of barrenness. During the season prior to flowering no offsets are made, and when a specimen flowers prematurely no seed is produced.—*C. T. D.*

Beet Rust (Quelques Études sur la Maladie de la Rouille des Betteraves). By Dr. J. Eriksson (*Rev. Gén. de Bot.*, xxv. 1914, p. 247; figs.).—An account of this disease, due to the fungus *Uromyces Betae*, is given, and the author considers that it is carried over winter by resting mycelium present at the apex of the root, and from generation to generation by "mycoplasm" in the seed. The elimination of infected seed should therefore do much to reduce the amount of beet rust. The author recommends that seed-beets should be grown away from districts in which the beet crop itself is cultivated. The attack of the fungus appears to lead to a reduced sugar content of the roots.—*F. J. C.*

Beetle, June (*Lachnosterna* spp.), **A Bacterial Disease of.** By L. Northrup (*U.S.A. Agr. Exp. Stn., Michigan, Tech. Bull.* 18, June 1914, pp. 1–37; 22 figs.).—The larvæ of the June Beetle (*Lachnosterna* spp.) cause much damage to crops and grassland. Like the Cockchafers, their life-history extends over three years, but during the second and third years the larvæ cause the greatest loss to crops. Their numbers are controlled to some extent by natural enemies—birds and mammals, various parasitic insects and fungi. Recently, however, attempts have been made to discover some micro-organism which could be utilized as a remedial measure against these destructive insects. The paper describes various experiments with a micrococcus which was found in diseased larvæ, and which occurs normally in many soils in Michigan and other States. This micrococcus has been successfully cultivated on various gelatine and agar media, and was found to be pathogenic to the larvæ of the June Beetle and the Cockroach (*eriplaneta americana*). It can retain its pathogenic potency for over one year under artificial cultivation. It is suggested that the micrococcus may be of considerable value in controlling other insect larvæ in the soil, and in Porto Rico experiments are being inaugurated with a view to test this suggestion, in connexion with the sugar-cane industry.

There is appended a short bibliography to the literature on this subject. *A. B.*

Begonia Perrieri. By D. Bois (*Rev. Hort.* June 16, 1915, pp. 500–2; 2 ill.).—A new introduction from Madagascar with decorative foliage. Tender. *C. T. D.*

Big Bud Mite, Experiments on. By A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 77–80).—The search for a sticky spray fluid (boiled oil and vaseline), while giving a reduced amount of infection in the following year, was not regarded as entirely satisfactory. Paraffin emulsion applied at the time of the opening of the buds, and of such a concentration that the soft soap was only sufficient to maintain the emulsion sufficiently long to permit the spraying to be accomplished, penetrated the bud and caused the death of a large proportion of the mites, up to 100 per cent. (·4 per cent. soft soap and 10 per cent. of paraffin were found necessary with the hard water available.) *F. J. C.*

Birds as Carriers of the Chestnut Blight Fungus. By F. H. Heald and R. A. Studhalter (*Jour. Agr. Res.* ii. Sept. 1914, pp. 405–422).—The authors found many spores of the chestnut blight fungus (*Endothia parasitica*) on the feet ar l bills of birds frequenting the diseased trees. They consider birds important factors in the dissemination of the spores of fungi.—*F. J. C.*

Black Currant Bud-Mite. By A. M. Taylor (*Jour. Agr. Sci.* vi. May 1914, pp. 121–135).—Two papers appear dealing with this troublesome pest. The first concerns the mode of infection of the black currant buds by the mites. Migration takes place mostly between March and early June. The mites are generally wind-borne, and they apparently hide at the leaf bases on the young shoots until the buds are large enough for them to enter. None was found beneath the bark, and very few in the soil.

The second deals with the occurrence of the mite on the gooseberry. Buds attacked do not enlarge as they do in the black currant; the leaves, however, become severely blistered and deformed, and the usual method of infection of new buds appears to be by crawling from the affected bud to the shoot developing from it. The foliage leaves in the bud do not appear to be attacked, and the typical blisters appear on the scale leaves. As a result of the attack the stem is reduced in length, leaves become yellowish green, and the whole bush unhealthy-looking. Certain other small differences in the life-history of the mite, which is apparently structurally similar to *Eriophyes ribis*, suggest a distinction between the forms on the two plants, but the plants themselves present several differences in bud-structure, and it is possible that the life-histories of the two species are determined by the differences in the hosts. No cross-inoculations appear to have been attempted, and the form on the gooseberry is said to be almost universally present.—*F. J. C.*

Blossoming of Fruit Trees, The Time of. By B. T. P. Barker (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 107–116).—Tables are given showing the sequence of flowering of various fruit trees at Long Ashton. Of apples the first to open were 'White Transparent,' 'Beauty of Bath,' and 'Bismarck,' the latest 'Court Pendu Plat' and 'Royal Jubilee.' 'Médaille d'Or' was the latest of the cider apples to flower. Of pears 'Louise Bonne of Jersey,' 'Beurré d'Amanlis,' and 'Beurré Clairgeau' are among the first, 'Hessle,' 'Catillac,' 'Pitmaston Duchess,' among the latest. 'Mallard' is the earliest plum,' Kirke's' the latest. The records since 1908 are given.—*F. J. C.*

Bordeaux Mixtures, Further Observations on the Fungicidal Action of. By B. T. P. Barker and C. T. Gimingham (*Jour. Agr. Sci.* v. May 1914, pp. 220–232).—The authors reply to Pickering's criticisms of their previous papers, and maintain (supporting their contentions by further experimental evidence) that living cells with readily permeable walls are able to produce and absorb soluble copper from insoluble compounds such as basic sulphates lying outside them. The fate of the organism producing it depends upon the relation between the amount of soluble copper produced and absorbed and the rate of growth of the organism. This will explain why at times a fungus which has already gained a foothold is but little checked by spraying with copper salts. Cells with impermeable cell-walls are incapable of action upon insoluble copper sulphates, but changes in their condition may cause them to become permeable. Such change probably occurs with age in such leaves as apple, and this may account for the difference in the results of spraying young and old foliage.—*F. J. C.*

Carnations, Layering. By R. P. Brotherston (*Garden*, July 18, 1914, p. 364). —Early *versus* late layering. Like other plants, the Carnation has a special period when roots are emitted for a brief time and produced with great abundance. It never happens that this period is forestalled, too late layering being the mistake. A slow-rooting and sparsely-rooted layer at the period when growth terminates for the year is in the worst condition to winter safely, and lacks needed strength in the spring. All the old writers on the Carnation favoured early propagation; some in June, none later than July. Early rooting must be followed by early transplantation.

In layering, a lengthy layer can be made secure from fracture by twisting it, and one too short to twist, when pressed back and slightly elevated while the process of placing it in the soil is being performed, will not snap off the parent plant. The tongues of layers sometimes curl up, and so, being raised above the surface, never root. This is prevented by fixing the usual peg so that it embraces the tongue of the layer as well as the part necessary to hold it down. The tongue should not be inserted deep in the soil. If a quarter of an inch above the slit be covered as well as the tongue, that is ample.—*H. R. D.*

Celery, A Bacterial Rot of. By H. Wormald (*Jour. Agr. Sci.* vi. May 1914, pp. 204–219; figs.).—An organism isolated from celery showing soft rot in the heart was inoculated into healthy celery and reproduced the disease. It apparently finds entrance mainly, if not entirely, through wounds, but these

are frequent and easily made in celery. The name *Bacillus apiovorus* is given to the organism, which appears to differ in certain characters from others which have been isolated from celery.—*F. J. C.*

Celery Leaf-spot, Spread of, by use of Affected Seed, and its Prevention. By G. H. Pethybridge (*Jour. Dep. Agr. and Tech. Inst. Ireland*, xiv. July 1914; figs.).—It has been proved definitely and clearly that the celery leaf-spot disease can be contracted and propagated by the use of affected seed bearing the fungus in a living state upon it. Further, that such seed may be rendered innocuous by soaking for three hours in hydrogen peroxide (10 or 20 vols.) or for three hours in formalin (1 part to 600 of water) without detriment to the seed.—*F. J. C.*

Chestnut-blight Fungus, Dissemination of Ascospores. By F. D. Heald, M. W. Gardner, and R. A. Studhalter (*Jour. Agr. Research*, iii. March 1915, pp. 493–526; maps and plates).—The authors give the results of a long series of experiments which show that the ascospores of this fungus are air-borne to over 400 feet from the source of infection.—*F. J. C.*

Chestnut Blight Fungus: The Persistence of Viable Pycnospores on Normal Bark below Lesions. By R. A. Studhalter and F. D. Heald (*Amer. Jour. Bot.* ii. April 1915, pp. 162–168).—A study of the part taken by birds and insects in the dissemination of the chestnut blight fungus (*Endothia parasitica* (Murr.) And.) has shown that these animals can carry large numbers of pycnospores, and these become lodged in normal bark below the lesions of the disease (p. 370).

Careful experiments were made with strips of normal chestnut bark 4 cm. × 4 cm., and of thirty-six pieces experimented with only five failed to yield positive results.

An abundance of viable pycnospores was obtained at as great a distance below a lesion as 70 cm. Most of the tests were made one or two days after rain. One series, tested fourteen days after a rain of ·56 inch, gave positive results in five cases out of a possible nine.—*A. B.*

Cider, Acetification of. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 25–26).—The acetification of cider can be prevented by the exclusion of air from the vessels in which it is kept. A new model trap to effect this exclusion has been devised and is described.—*F. J. C.*

Cider Sickness, The Treatment of. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 22–24).—The results of experiments go to show that increase of acidity, either by blending acid and sweet ciders or by the addition of tartaric acid, affords the surest means of reducing the amount of cider sickness. The acidity should be brought up to .5 per cent. Other possible methods are suggested.—*F. J. C.*

Cider, The Blackening of. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 34–35).—The presence of iron in the juice leads to the blackening of cider on exposure to the air. The author recommends that iron utensils should be used as little as possible in making cider, and where their use is essential they should be washed immediately before and after use.—*F. J. C.*

Ciders and Perry, 1913–1914, Single Variety. By B. T. P. Barker and O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 11–21).—Gives analyses of ciders and perry made from single varieties of apples and pears.—*F. J. C.*

Citrus, A Powdery Mildew of. By C. N. Carter (*Phytopathology*, v. June 1915, pp. 193–196; plates).—A mildew was found on Tangerine oranges (one variety only, 'Dancy') which appears to be new. The name *Oidium tingitaninum* is proposed for it. Warm weather, fog, and abundant new growth occurring together appear necessary for the development of the disease.—*F. J. C.*

Citrus Canker II. By E. W. Berger, H. E. Stevens, and F. Stirling (*U.S.A. Agr. Exp. Stn. Florida, Bull.* 124, Oct. 1914, pp. 26–53; 14 figs.).—This paper supplements Bull. 122 and describes the laboratory investigations into the cause of this disease. It is closely related to the Stem-end Rot (*Phomopsis citri*), but appears to be a much more virulent organism. It has been placed in the genus Phyllosticta, but further study is necessary before its true position can be definitely determined.

The paper further deals with the attempts made to eradicate the disease in Florida, and describes the drastic measures taken to prevent the spread of the

disease. These included the burning of many thousands of infected trees with kerosene, and the disinfection of the soil with fire, in certain districts in Dade County.—*A. B.*

Clematis alpina carunculosa. By S. Mottet (*Rev. Hort.* Aug. 16, 1915, pp. 534–5; 1 ill.).—Described as a vigorous floriferous variety, with yellow flowers in May and June; seed-vessels subsequently very decorative. Quite hardy and highly recommended.—*C. T. D.*

Clematis montana rubens. By G. T. Grignan (*Rev. Hort.* March 16, 1915, p. 428).—Explanation relative to short life of many plants of this variety, due to injudicious grafting. Best grown on own roots. Also by F. Morel and L. Mottet, April 1, 1915, 443–5, with suggestions as to the cultivation of this and other noteworthy forms of Clematis.—*C. T. D.*

Coffee, Fungus Diseases of, in Porto Rico. By G. L. Fawcett (*U.S.A. Agr. Exp. Stn. Porto Rico, Bull.* 17, pp. 1–29, Feb. 1915; 8 plates).—The commoner diseases of the coffee are herein described, and include the Leaf Rot (*Pellicularia koleroga*), the Leaf Spot (*Stilbella flavida*), the Berry Spot (*Cercospora coffeicola*), and the Stem Rot (*Fusarium* sp.). For the control of the first two, repeated sprayings with Bordeaux mixture are of great value, while for the control of the *Cercospora coffeicola* shading the plants is of value in checking the spread of the disease. It is, however, of importance " to keep the still healthy younger plants in good condition, rather than attempt to exterminate the diseases amongst the older trees."—*A. B.*

Columnea gloriosa var. **superba.** By D. Bois (*Rev. Hort.* June 16, 1915, pp. 503–5; col. pl. and 1 ill.).—A pretty plant for suspended baskets, forming long, slender branches, bearing numerous bright red, somewhat Pentstemon-like flowers. Warm greenhouse, winter flowering.—*C. T. D.*

Conifers, Notes on. By A. Bruce Jackson (*Gard. Chron.* 1915).—A continuation of critical notes and figures. Those now dealt with are: *Cupressus arizonica*, June 5, 1915, p. 315, with fig.; *C. funebris*, Aug. 7, p. 78, with fig.; *C. cashmeriana*, Sep. 25, p. 196, with fig.—*E. A. B.*

Co-operation in the Distribution and Marketing of Fruits. By E. Meeking (*Jour. Agr. Victoria*, Oct. 1914, pp. 605–9).—Wherever the co-operative principle has been adopted, the following would appear to be the chief essentials for success:—

1. Thorough preliminary organization by the selection of the more intelligent growers in each district as organizers.
2. Large subscribed capital.
3. Wide distribution of shares.
4. Good management.
5. Business-like rules.
6. Loyalty from shareholders.
7. Clauses in articles of association to penalize disloyal shareholders.
8. The establishment of central packing-houses in each district.
9. Packing near point of production.
10. Selling, when possible, near point of production.
11. The introduction of cool storage accommodation and ice-car transport.
12. The formation of (*a*) district associations; (*b*) central distributing exchanges.
13. Incorporation of district associations with central distributing exchanges.
14. Dividends to shareholders never to be above the current bank rate of interest.
15. The selling of fruits in standardized grades; such grades to be always typical of quality.
16. Fruits, whenever possible, to be handled in large lots.—*C. H. H.*

Crops, How they can be grown without Potash Manures next year. By E. J. Russell, D.Sc. (*Jour. Bd. Agr.* xxii. 5, August 1915).—A long and technical article, essentially for farmers, but interesting and useful to horticulturists. Dr. Russell points out that all sources of potash already on the farm, *e.g.* wood ashes, damaged straw, mangold and other leaves, liquid manure &c., should be conserved and not wasted, as is often the case in normal times. He also points out that in well-farmed soil much potash is locked up, and this can be liberated by the application of sodium salts, such as sulphate of sodium or agricultural salt or by application of lime.—*G. C. G.*

Cucumber Diseases (Svampsjukdomar å svenska gurkväxtodlingar). By J. Eriksson (*Centralst. för försöksväsendet på jordbruksområdet*, No. 76; 1913).—Descriptions of the principal diseases of the cucumber, including scab due to *Cladosporium cucumerinum*, which attacks both fruit and foliage (for which spraying with a 1 per cent. solution of formalin is recommended); leaf blotch or brand, due to *Cercospora Melonis*, which also attacks fruit and foliage (for which various cultural modifications are advised); "rust" due to *Colletotrichum lagenarium*, which does not appear to have occurred in this country so far, and which attacks leaf, stem, and young fruit.—*F. J. C.*

Deutzia longifolia var. **Veitchii.** By S. Mottet (*Rev. Hort.* Aug. 16, 1915, pp. 536–7; col. pl.).—A very charming *Deutzia* with bunches of delicate warm rose-pink flowers.—*C. T. D.*

Effect of One Crop upon Another. By the Duke of Bedford and S. U. Pickering (*Jour. Agr. Sci.* vi. May 1914, pp. 136–151).—The grassing of land in which fruit trees are planted is usually followed by bad effect upon the trees. The foliage and bark are of an unhealthy, light colour; there is a deficiency of chlorophyll in the fruit. The authors have now carried their experiments further with other plants in order to test their hypothesis of the production by the grass of a substance toxic to the trees. They report the results of their experiments here, and conclude that every growing crop results in the formation of a substance which is toxic to the growth of other plants and still more so to itself; that by oxidation the toxin loses its toxic properties and enhances soil fertility, so that plants previously poisoned eventually outstrip those which were not subjected to the poison, unless, of course, the poison has already produced permanent stunting. The débris from the growing plant probably accounts for the formation of the toxin. They consider that heating of soil also produces a toxin in it in considerable quantities, and that part at least of the increased growth subsequently produced is due to the increased fertility resulting from the oxidation of the toxin.—*F. J. C.*

Egg-plant Disease. By L. L. Harter (*Jour. Agr. Res.* ii. Aug. 1914, pp. 331–338; plates).—*Phomopsis vexans* causes a leaf-spot, stem-blight, and fruit-spot disease of the egg-plant. This fungus has been variously called *Phyllosticta hortorum*, *Phoma solani*, and *Ascochyta hortorum*, and the author shows that all these forms are identical and belong to the genus *Phomopsis*. The early death of the seedlings attacked is certain, as the stem is quickly girdled, while a brown, dead, finally irregular spot is produced on the foliage. The diseased fruit is at first soft and musty, but later mummified and black. Neither tomato, sweet-potato, *Datura*, nor *Capsicum annuum* were infected after the application of the fungus.—*F. J. C.*

Erodiums or Heron's Bills. By R. A. Malby (*Garden*, Jan. 17, 1914, p. 33, and fig. p. 34).—The genus is not cultivated in the alpine garden so much as its beauty justifies. Many of the species are not difficult to cultivate if given very gritty soil and a position open to the sun all day. *E. chrysanthum*, *E. Guicciardi*, *E. daucoides* (carrot-leaved), *E. macradenum*, *E. Sibthorpianum*, *E. corsicum*, *E. supracanum* and its beautiful white form, *E. trichomanefolium*, are recommended. Flowers are produced in quantity from May to August.

An interesting feature is the way in which the angle of the flower-stalk varies after pollination. As a rule the flowers are produced in clusters of five on short stalks rising from the upper part of a rigid main stalk 5 to 9 inches long, and when they open they are in the same plane as this main stalk, *i.e.* pointing upward. After pollination the short foot-stalk bends at the point of juncture at a right angle, while the fruit alters its angle on the foot-stalk so as still to point upward, but leaving room for the later flowers to expand.—*H. R. D.*

Fermentation Purposes, Relative Value of Cane and Beet Sugar for. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 32–33).—In experiments with cider fermentations (which are described) cane sugar and beet sugar were used. Where the former was used the cider kept badly and acquired the taste of cane sugar, while in the latter case the cider kept well and had none but normal flavour.—*F. J. C.*

Flies, Borax a Preventive of (*Jour. Dep. Agr. Vict.* Dec. 1914, p. 744).—Half-pound of borax to eight bushels of horse manure kills the fly eggs and maggots, and prevents breeding of flies. Above this proportion, borax is somewhat harmful to vegetation; a quantity of borax may harm fattening pigs.

The borax is sprinkled from a flour sifter. Borax costs 2½*d.* to 3*d.* per lb.

At a cost of a halfpenny a horse a day, the breeding of all flies on the manure may be prevented.—*C. H. H.*

Flora of British Columbia. By J. Davidson (*Rep. Bot. Off., British Columbia,* 1915).—Gives a detailed account of two botanizing expeditions in the mountains of British Columbia, with special notes on *Geum* and *Lupinus*, as well as on other plants of horticultural interest.—*F. J. C.*

Flower Colour, Chemistry of Mendelian Factors for. By M. Wheldale (*Jour. Gen.* iv. Oct. 1914, pp. 109–129; plate).—The colours of *Antirrhinum majus* varieties are mainly considered. Ivory white and yellow do not contain anthocyanin. Ivory is dominant to yellow. Yellow contains two flavones, apigenin (pale) and luteolin (deep), therefore ivory contains an inhibitory factor for the last. White contains no flavone. Evidence is adduced which leads the authoress to conclude that anthocyanin is a derivative, either by oxidation or condensation (or both), from a flavone. Both a red and a magenta colouring matter have been isolated from *Antirrhinum*, and both have a higher percentage of oxygen than the flavone, the magenta higher than the red; the molecular weights are also higher. Other authors hold somewhat different views as to the nature of anthocyanin, some believing it to be a reduction product of the flavones. A brief note by Prof. Everest in the same journal calls in question the purity of the colour substances upon which some of the foregoing conclusions have been based.

F. J. C.

Formalin for Seed Potatos. By F. W. Ulbrich (*Queensland Agr. Jour.* Sept. 1914, p. 196).—The use of formalin as a steep for tubers is confidently recommended; it is immaterial whether tubers be dipped cut or whole. The steep recommended is 1 lb. bottle of formalin to thirty-two gallons of water.

Tubers must be allowed to dry after being steeped, before planting. Tubers or sets should be steeped for two hours, but should a grower forget to remove any from the dip at the end of two hours he need not be alarmed, as the writer has had "no misses" from sets (cut) that had an all-night bath. This experience has been verified by more than one grower.—*C. H. H.*

Fowl Manure (*Jour. Dep. Agr. Vict.* Nov. 1914, p. 696).—Is found specially good for grass, air-dried fowl manure applied at the rate of a ton an acre.

Fresh fowl manure has approximately the following composition (Storer): water 56 per cent.; organic matter 25·5 per cent.; nitrogen 1·6 per cent.; phosphoric acid 1·7 per cent.; potash ·8 per cent.; lime 2·2 per cent.; magnesia ·8 per cent.

A hen produces approximately 12 lb., a duck 18 lb., and a goose or turkey 25 lb.

Air-dried fowl manure containing 20 per cent. moisture would contain in a ton approximately :—

Organic matter (46·4 per cent.)	1,040 lb.
Nitrogen (2·91 per cent.)	65 ,,
Phosphoric acid (3·10 per cent.)	33 ,,
Lime (4 per cent.)	90 ,,
Magnesia (1·46 per cent.)	33 ,,

The value of a ton of fresh fowl manure is about £1. One ton of fresh manure is produced annually by about 190 birds.—*C. H. H.*

Fritillaries, Garden. By R. W. Wallace (*Garden*, Sept. 12, 19, and 26, 1912, pp. 451, 465, and 478).—The writer derives the name from the Latin *fritillus*, a dice-box. Less than half the known species are in cultivation, and of the thirty or so in nursery lists few are known and appreciated as they deserve. *F. Meleagris* (snake's head) has several varieties. Parkinson knew a dozen, but half that number is sufficient. He mentions *alba*, a pure white form, 'Emperor,' which is distinct, 'Orion' and 'Cassandra.' He regards *F. contorta* with the segments of the perianth partly united, forming a slender trumpet, as a sport. *F. Imperialis*, the 'Crown Imperial,' has several varieties; the best are the large yellow *F. maxima lutea* and giant red. *F. inodora* is a scentless form from Bokhara.

F. chitralensis (A.M. 1910), a yellow fritillary from Chitral, is more slender than the 'Crown Imperial' and has scattered leaves. *F. pallidiflora* he places next; it has large creamy yellow bells in a loose inflorescence, flowering throughout April.

F. persica, an old favourite, he puts fourth; the flower-stems rise to 2 or 3 feet, carrying fifty plum-purple metallic-looking bells in April and May; the foliage also is handsome. *F. pontica*, representing a small group of which it is the best, is almost entirely pale green. The large long bells, generally solitary, are

very handsome in shape; they have no chequering, but a rich glaucous bloom covers the flower. With this may be placed *Elwesii* and *acmopetala*, which are good perennials with showy evert seed-pods.

F. Thunbergi, an interesting little Japanese species, seldom seen, spreads easily, and represents a distinct section having slender leaves with curled hook-like tips, and little masses of grey foliage. *F. discolor*, an abnormal form, also named *Korolkowia discolor*, is handsome but not showy, on account of the large leaf-like grey bracts which subtend the flowers. These are star-shaped, held almost horizontally on short stems; they are greenish yellow and crimson, with crimson anthers, and appear in early March.

F. macrophylla, a strange plant named by Wallich *Lilium roseum* and by Lindley *L. Thompsonianum*, bears a long panicle of rosy-lilac flowers in April and May. The author has not succeeded in keeping it long.

F. camtschatcensis (Linnaeus' *Lilium camschatcense*), the Black Lily, is another difficult plant. The blackish maroon flowers with yellow anthers are very striking.

F. obliqua, however, which also has blackish bells, succeeds better. *F. aurea*, from the alpine pastures of Cilicia, and *F. armena*, from Asia Minor, are delightful little plants and cheap.

F. pyrenaica, from the Pyrenees, is easily kept. It grows about a foot high, and carries solitary fleshy bells, purple maroon outside, glossy green within.

F. Moggridgei, which makes sheets of yellow in the upland slopes of the Maritime Alps, and its relative the plum-purple *Burnati*, though stated to be very easily managed, now exist in few gardens.

F. latifolia, from the Caucasus, is not a difficult plant. The flowers vary from purple to lilac, and resemble *F. Meleagris*, but are darker and more fleshy.

F. recurva and American species.—These do not come under the heading hardy perennials; they have been divided into two sections: (1) low-growing plants with leaves clustered about the base and several widely bell-shaped flowers, and (2) taller plants with leafy stems, leaves in whorls, and flowers bell-shaped in long racemes. Of the first group *liliacea*, *biflora*, and *pluriflora* are in cultivation, while the scarlet *recurva* and *coccinea* and the rich yellow *pudica* best represent the second.

Early planting is desirable, and, with the Asia Minor varieties, there should be a good percentage of lime in the soil. During growth ample water supplies are recommended.—*H. R. D.*

Fruit Fly, Mediterranean, Citrous Fruits and. By E. A. Back and C. E. Pemberton (*Jour. Agr. Res.* iii. pp. 311–330, Jan. 1915; figs. and plates).—The Mediterranean fruit fly (*Ceratitis capitata*) was thought to readily attack citrous fruits, but the authors show that they are not favoured hosts of these pests. Grape-fruit, oranges, lemons, and limes become badly infested if left on the trees until overripe, but are rarely attacked before. The oil from the cells broken in making the cavity for the reception of the egg kills many eggs, and it is only eggs laid in old cavities that hatch out. The fly is very quickly affected by low temperatures, 50° to 55° F. imposing a severe check. The recommendation is made to remove non-citrous fruits from the neighbourhood of citrous trees in order to destroy the between-season breeding-places.—*F. J. C.*

Fruit Fly, Mediterranean Life-history and Parasite Introduction. By E. A. Back and C. E. Pemberton (*Jour. Agr. Res.* iii. Jan. 1915, pp. 363–374; plates).—Methods of preserving the flies in order to secure the dissemination of their parasites are fully discussed.—*F. J. C.*

Fruit Trees, Effects of various Dressings on Pruning Wounds on. By G. H. Howe (*U.S.A. Agr. Exp. Stn., New York, Bull.* 396, Feb. 1915, pp. 82–94).—It has long been the custom of fruit-growers to use paints, tars, waxes, and other substances as coverings for wounds in trees. The objects of such treatment were to enable the trees to heal the wounds quickly and to prevent the entrance of fungi and insect pests into the wounds. Experiments were devised to determine (1) if such treatment was necessary, and (2) to find if any substance used was superior to others for this purpose. The trees used in the work were apples and peaches, while the materials for covering the wounds were white lead, white zinc, yellow ochre, coal tar, shellac, and avenarius carbolineum. Dressings of these substances were applied at different periods of the year and upon wounds of different ages. The conclusions arrived at were as follows:—

1. In all cases, undressed pruning wounds have healed more rapidly than those whose surfaces have been protected.
2. Shellac seemed to exert a stimulating influence upon the wounds during

the first season, but this effect disappeared in the second season. Of all materials used, shellac was least injurious.

3. Avenarius carbolineum and yellow ochre caused so much injury that neither substance should ever be used.

4. Coal tar is also injurious, but quickly disappears either through absorption or evaporation.

5. White lead and white zinc caused some injury at the outset, but the wounded tissues recovered quickly, and the injury was not very marked at the end of second season. These two paints are the best of the protective substances used, and of the two white lead is the better.

6. Nothing is gained, in the treatment of wounds, in waiting several weeks before applying any of the various dressings used in these experiments.

7. The treatment of peach-tree wounds with any of these substances caused so much injury that it may be said that the peach should never be treated with any of them. This probably applies to all stone-fruit trees.

8. There is nothing to show that it is worth while to treat wounds, large or small, of fruit trees with any of these substances used in the experiments. But in the case of very large wounds it may prove of value to cover with a dressing of white lead.—*A. B.*

Fruit Trees, Ringing of. By G. H. Howe (*U.S.A. Agr. Exp. Stn., New York, Bull.* 391, Dec. 1914, pp. 575–584; 1 plate).—The object of ringing is to induce and increase fruitfulness, but it is an operation requiring great care and should only be resorted to when all other means fail. The success of the operation hinges upon the fact that in June and July the greatest activity of the cambium is apparent, and this leads to the rapid formation of new bark. Any attempt at ringing when the growth is dormant or sluggish always results in the death of the tree.

Experiments were made upon apples, plums, pears, and cherries, and extended over three years. The objects were to determine, if possible, the extent to which fruit trees can be ringed without injury, and in what degree, if any, the operation induces and stimulates fruitfulness.

The conclusions arrived at were:—

1. Ringing seems to favour certain organs for a time, but devitalizes others.

2. The removal of narrow strips of bark is less injurious to plant growth than the removal of wider rings.

3. Under certain conditions, ringing may induce and increase fruitfulness in apples; but it rarely has these favourable effects on other fruit trees.

4. Only young and vigorous apple trees—occasionally, pear and cherry trees—can survive ringing.

5. Ringing stone-fruit trees is not recommended. Nearly all so treated in the experiments died.

6. Ringing has no apparent influence upon the size, colour, or maturity of apples.—*A. B.*

Fungi (Mushrooms, Harmless and Poisonous). By L. Bourguignon (*Rev. Hort.* April 16, 1915, pp. 455–7; May 16, pp. 487–92; and July 16, pp. 518–21; 3 coloured plates and 1 plain).—A series of interesting descriptive articles on edible, poisonous, and deadly fungi of the mushroom type.—*C. T. D.*

Fungous Diseases of Insects, The Economic Status of. By R. W. Glaser (*Jour. Econ. Entom.* vii. p. 473, Dec. 1914).—A discussion on the possible value of fungi for the extermination of insects and in praise of the use of *Entomophthora aulicae*, a parasite of the brown-tail moth, which has proved so troublesome an insect in certain parts of the States. Reference is made to the paper by Messrs. Speare and Colley, where details of the mode of cultivation and distribution are given.—*F. J. C.*

Gooseberry Mildew, American Experiments on, in Cambridgeshire. By F. T. Brooks, F. R. Petherbridge, and G. T. Spinks (*Jour. Bd. Agr.* xxii. 3; June 1915).—Experiments were made to ascertain whether some form of spraying or soil treatment on a commercial basis could replace tipping (removal of diseased tips). Twenty-two plots were treated with various fungicides, including Bordeaux mixture, lime-sulphur solution, formalin, caustic soda, copper sulphate or dilute sulphuric acid, while soil was treated with kainit, sulphate of iron, or basic slag.

Conclusions reached were that spraying with lime-sulphur or Bordeaux mixture in early spring checks development of disease to some extent but not sufficiently to repay cost of application; all forms of soil treatment and winter spraying appeared valueless in checking disease the following season; heavy applications

of farmyard manure favour disease; early tipping of diseased shoots, as soon as growth of bushes has stopped for season, is the only practical means known at present for reducing disease.—*G. C. G.*

Gooseberry Mildew, American, Spraying Experiments on Summer Stage of. By B. T. P. Barker and A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1914, pp. 73–76).—A spray designed to kill the mycelium and spores, followed by one designed to cover the bush and protect it against future infection, were applied. Considerable difficulty was found in wetting the fungus, the best results being obtained with a 2 per cent. paraffin emulsion (soft soap 20 lb., paraffin 2 gallons, water 100 gallons) followed by ordinary Bordeaux mixture (copper sulphate 8 lb., quicklime 8 lb., water 100 gallons). Lime-sulphur, soda Bordeaux, and soluble sulphur caused considerable defoliation.—*F. J. C.*

Gooseberry Mildew, A Note on American. By M. A. Bailey (*Ann. Appl. Biol.* ii. July 1915, pp. 158–165).—The author describes the incidence of this disease on batches of seedling gooseberries in three consecutive years, and suggests that the germination of the spores near the top of the bushes is due rather to the variations which occur in temperature &c. than to the infection of the bushes through perithecia resting near the top of the bushes, as has been suggested.—*F. J. C.*

Gooseberry Mildew, The Perithecial Stage of. By E. S. Salmon (*Jour. Agr. Sci.* vi. May 1914, pp. 187–193; figs.).—The author describes the opening of the perithecia of *Sphaerotheca Mors-Uvae*, and suggests that occasionally, at any rate, the winter spores (which are produced in some cases as early as May) germinate and reproduce the disease in the same season as they are formed. Most of the mature perithecia appear to drop early, for none of those examined by Mr. Salmon, collected in February, contained winter spores. This means that the soil about the plants is apt to become thoroughly infected quite early in summer or autumn.—*F. J. C.*

Grape Affection, A. By F. E. Gladwin (*Phytopathology*, v. June 1915, pp. 169–174; fig.).—A leaf-blight disease in which the apical leaves of affected shoots show yellow streaking in the intervenal spaces; a little later other leaves develop pallor, the discoloration being most marked near the margin, where a yellow band is produced, which subsequently dies. At other times brown spots develop on the leaves. The fruits do not colour well, nor are they so sweet as normal ones. The author traces this trouble to interference with the water supply, generally through ill development of the root system in comparison with the shoots.—*F. J. C.*

Grapes, Dead-Arm Disease of. By Donald Reddick (*U.S.A. Agr. Exp. Stn., New York, Bull.* 389, July 1914, pp. 463–490; 8 figs., 6 plates).—The dead-arm disease of grapes is found in the majority of vineyards in the States, and is caused by the fungus *Cryptosporella viticola* Shear. The most striking features of the disease are the presence of bare arms in the spring and the production of dwarfed, yellow-coloured leaves during the early part of the growing season.

The fungus produces both perithecia and pycnidia, the last being the commoner method of reproduction. Numerous conidia and scolecospores are exuded from the pycnidia in the spring, and readily infect the growing shoots of the vines and cause their death. The fungus is unable to live underground, and rarely passes down the stem to the roots.

The chief method of control suggested is the removal of all vines showing symptoms of the disease. Suckers originating from below the surface of the ground are usually strong and vigorous vines, and, unless infected in the first few weeks, can resist the disease to a great extent.

There is appended a short bibliography.—*A. B.*

Grapes, A Test of Commercial Fertilizers for. By U. P. Hedrick and F. E. Gladwin (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 381, March 1914).—The value of commercial fertilizers as a paying proposition was well proven in the State vineyard, particularly those containing all the necessary ingredients.

However, the co-operative experiments in the various private vineyards proved both contradictory and unsatisfactory.

The authors imply that the decrease in grape yield generally complained of was not due so much to want of fertilizing material as to want of co-ordination in methods, and suggest that in the order as given, (1) good drainage, (2) control of pests, (3) improvements in tillage and general care, (4) and then the addition of such fertilizers as may be found necessary, would prove to be the remedy or remedies needed.—*C. P. C.*

Grapes, Fertilizers for (*Jour. Dep. Agr. Vict.* Jan. 1915, p. 58).—In a series of trials of commercial fertilizers with grapes at the New York Experimental Station, nitrogen was applied in the form of sodium nitrate, dried blood, and cotton-seed meal; phosphorus as superphosphate; potassium as potassium sulphate; lime was also tried. Nitrogenous fertilizers had a markedly beneficial effect upon the yield and quality of the fruit, leaf, and wood growth, whereas lime had no effect, and phosphorus and potassium had so little effect that the use was not profitable. To restore a failing vineyard, the steps required usually in the order of importance are: to secure good drainage, control insects and fungi, improve the tillage and general care, and apply such fertilizers as may be found lacking, nitrogen being probably the element most frequently needed.—*C. H. H.*

Hybrids, Method of Comparing with Parents. By G. N. Collins (*Jour. Agr. Res.* iii. Oct. 1914, p. 85).—The author has developed a method of comparison between the yields of first-generation hybrids and their parents, designed to give greater accuracy than has usually been attained. First-generation hybrids frequently give yields greatly above that of the strains from which they are derived, but the yields of hybrids raised by similar crosses vary considerably among themselves.—*F. J. C.*

Iron and Aluminium Salts on Clover Seedlings, Toxic Effects of. By R. W. Ruprecht (*U.S.A. Agr. Exp. Stn., Mass., Bull.* 161, April 1915, pp. 125–129; 2 plates).—Sulphate of iron and sulphate of aluminium are shown to have a very harmful effect upon the roots of clover plants, and carbonate and hydrate of lime neutralize these injurious properties of the salts of iron and aluminium in dilute solutions. The toxicity of iron and aluminium sulphates is due to the penetration of the salts into the roots of the seedlings, but is apparently restricted to the two outer layers of cells in the growing regions of the roots. The poisons do not kill the entire root systems of the plants.—*A. B.*

Jack-Pine, Observations on the Pathology of the. By James R. Weir (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 212, May 1915, pp. 1–10; 4 figs., 1 plate).—The Jack-Pine (*Pinus divaricata* (Ait.) Du Mont. de Cours) is essentially a plant of the sandy plains near the Great Lakes, but a variety is met with in moist soils, and this is more susceptible to diseases, the more important of which are *Peridermium cerebrum* Peck., which may attack young trees as well as older trees; *Trametes pini* (Brot.) Fr. and *Polyporus Schweinitzii* Fr., which are timber-destroying fungi; and numerous saprophytic fungi which also rapidly destroy the timber of this pine.—*A. B.*

Larch, A Hybrid. By A. Henry (*Gard. Chron.* Sept. 18, 1915, pp. 178–9, with 4 figs.; Oct. 9, p. 234).—The original tree of *Larix pendula* Salisb. is shown to have been a hybrid (*L. americana* × *europaea*). Its descendants as now known vary considerably. At one time erroneously identified with *L. dahurica*, yet this hybrid is abundantly distinct.—*E. A. B.*

Lilium candidum, Sterility of. By A. Grove (*Gard. Chron.* July 10, 1915, p. 20).—A puzzle for centuries, and still unsolved. Due to neither self-sterility nor lack of heat, for pollen brought from distance fails to set seed, and no unusual number of seeds were produced in hot seasons of 1911 and 1914.

Often fertile in response to pollen of *L. testaceum*; and cutting off the stalk at ground level before end of flowering period, or stripping scales off the bulb, have frequently caused pods to ripen. Naudin thought sap insufficient to nourish both bulb and seed, and if left to nature the bulb alone supplied.

E. A. B.

Lime, Leafspot Disease of. By E. S. Salmon and H. Wormald (*Gard. Chron.* Sept. 25, 1915, pp. 193–4, with 2 figs.).—Disease due to *Gloeosporium tiliaecolum*, widespread on limes in Germany and Denmark, but not hitherto recorded in this country. Outbreaks occur in the spring, and so far have only been noted on *Tilia ulmifolia*.—*E. A. B.*

Lime-Sulphur Sprays, Preparation and Composition. By A. A. Ramsay (*Jour. Agr. Sci.* vi. May 1914, pp. 194–203).—An account of the constituents of lime-sulphur sprays is given.—*F. J. C.*

Lime, The Use of, in the Garden. By D. Houston (*Garden*, Feb. 28, 1914, p. 111).—This article gives a useful sketch of the value of lime for garden soils. Its beneficial influence is considered under three heads: (1) Its value in improving

the texture of soils by coagulating clay soils, rendering them more pervious to moisture and increasing the water-holding properties of light soils; (2) its chemical effect in correcting the acidity of soils; (3) its biological influence in promoting the activity of nitrifying bacteria. A caution is given with regard to its use with certain plants, *e.g.* foxglove and Erica, which dislike lime, and it is noted that lime has been found to have a distinctly bad effect upon the yield of potatos.

Lord Sherborne, however, March 14, p. 126, points out that *Erica carnea* grows freely in the Cotswolds on limestone soil; while J. D., March 21, 1914, p. 143, has found liming beneficial to potato crops.—*H. R. D.*

Liming the Soil on a Crop of Clover, The Effect of. By F. W. Morse (*U.S.A. Agr. Exp. Stn., Mass., Bull.* 161, April 1915, pp. 119–124).—This paper shows that liming a soil increases the size of the clover plants and that the percentage of nitrogen is increased when the soil is so treated, or on soils without an application of nitrogen, or when supplied with sulphate of ammonia. The increase in the assimilation of nitrogen was apparently promoted by the action of the lime on the properties of the soil, and not by its action within the plants. *A. B.*

Manuring Fruit Trees (*Queensland Agr. Jour.* Aug. 1914, pp. 141–143).—The results of experiments by Mr. Alfred Thiessen, of Geeveston, Tasmania, on apple trees, started 1912, three plot trials as follows:—No. 1 left unmanured; No. 2 received per tree 3 lb. superphosphate, 2 lb. bone-dust, ½ lb. sulphate of ammonia, 1½ lb. sulphate of potash; No. 3 received 3 lb. superphosphate, 2 lb. bone-dust, ½ lb. sulphate of ammonia.

The yields calculated from an acre were for the first year: Plot 1, 560 cases; Plot 2, 800 cases; Plot 3, 667 cases. The yields for the second year were equal to Plot 1, 525 cases; Plot 2, 1,022 cases; Plot 3, 915 cases. In the second year the trees on Plot 2 complete fertilizer received an additional 1½ lb. sulphate of potash.—*C. H. H.*

Melon Fly, Life-History of. By E. A. Back and C. E. Pemberton (*Jour. Agr. Res.* iii. Dec. 1914, p. 269).—*Bactrocera cucurbitae* Coq. causes great damage to water melons and cantaloupes; pumpkins and cucumbers are also attacked. The fly oviposits both in the young fruit and in the unopened flower, in the stem and even in the seedlings of the water-melon and cantaloupe. Entire fields in Hawaii have been killed by the larvæ boring into the plants. Beans, peas, peaches, papayas and other soft fruits are liable to attack. Full outlines of the life-history are given. The wrapping of the young fruits in cloth or paper, or burying them in the soil, has met with some success.—*F. J. C.*

Milton, Flowers of. By Canon Ellacombe (*Gard. Chron.* July 17, 31, August 7, 14, and 21, pp. 33, 69, 89, 99, 113).—An alphabetical enumeration of all the plants mentioned by Milton, with short notes for identification or illustration of the names.—*E. A. B.*

Mosaic Disease of Tobacco, Effect of Dilution upon the Infectivity of the Virus of. By H. A. Allard (*Jour. Agr. Res.* iii. Jan. 1915, p. 295).—Dilutions of the virus 1 part in 1000 of water produced infection as readily as did undiluted virus, but 1 part in 10,000 is less readily infective. Enzymic activities are held by many to be the source of the disease, but the author considers parasitism responsible and "by far the simplest and most reasonable explanation of its origin." The parasite has not, so far, been isolated.—*F. J. C.*

Mulberry Blight, The South African. By E. M. Doidge (*Ann. Appl. Biol.* ii. pp. 113–124, July 1915; plates).—A disease characterized by the death of the tips of many branches and the appearance of brown spots on the foliage attacks certain mulberries in South Africa, black mulberries (*Morus nigra*) being especially liable to attack. Spraying with fungicides has proved unavailing. A bacillus identical apparently (except for the number of flagellæ) with *Bacterium Mori* was isolated and is regarded as the cause of the disease. Probably pruning away of diseased twigs would prove the most effective remedy.—*F. J. C.*

Nodule Bacteria, Six Different Species of. By H. Garman and Mary Didlake (*U.S.A. Agr. Exp. Stn., Kentucky, Bull.* 184, pp. 343-363, Aug. 1914; 7 figs.).—This paper describes the various organisms producing nodules on the roots of various Leguminosae, including specific organisms on the roots of Alfalfa (Lucerne), Clover, Garden Pea, Vetch, Soya Bean, Garden Bean, and Cow-pea. A series of interesting experiments for the cultivation of the bacteria producing the nodules under sterile conditions are described. The sterilization of the large seeds used in the experiments presented much difficulty, but treatment with

formalin, corrosive sublimate, and hot water proved effective. The sterile seeds were grown on an agar medium within large test tubes which were previously sterilized, and then inoculated with a pure culture from a nodule. From these experiments the authors conclude that bacteria producing nodules on the roots of leguminous plants are of several different species which apparently have no relation with each other; also that a species may produce nodules on one plant or on several plants, closely allied to the first plant.—*A. B.*

Orchard, The Effects of Fertilizers in a Cultivated. By J. H. Godfrey (*U.S.A. Exp. Stn., New Hampshire, Bull.* 168, Jan. 1914).—In the course of the five years' experiments carried out by the author, it was shown that no value, commensurate with the increase of cost, was given by the addition of commercial fertilizers where constant tillage was practised.

Where the orchard was under grass, the gains, however, were considerable.

Incidentally the experiments greatly emphasize the value of cultivation, as against letting orchards down to grass, the gains in average number of fruits being 116 per cent., in weight 101 per cent.—*C. P. C.*

Osmanthus Anon. (*Garden*, July 18, 1914, p. 365).—The best known species is *O. Aquifolium*, sometimes known as *O. Aquifolium ilicifolius*. This, the Holly-leaved Osmanthus, is a native of Japan, whence it was introduced nearly sixty years ago. It is known here as a bush 6 to 10 feet high, but travellers in Japan mention plants between 20 and 30 feet in height. Its holly-like leaves average about 2 inches in length, and as the bushes advance in height the upper leaves lose their spiny character and the margins become entire, as in those of the holly. It is also possible, as in the holly, to perpetuate the spineless form by rooting cuttings from the upper part of a mature bush. Added to its usefulness as an evergreen, it is worth growing for the sake of its fragrant white flowers, which appear in small clusters from the leaf axils between early October and Christmas.

O. rotundifolius is a low-growing compact shrub with dark green rounded leaves; *O. purpureus* with leaves of a dark purplish hue, and *O. variegatus* with silver variegated leaves. *O. purpureus* is the most useful and quite hardy. *O. Fortunei* is a very vigorous shrub with large, dark, rather dull green oval leaves. In the milder counties it is sometimes 12 feet in height, carries white fragrant flowers during October and November, and is said to be a hybrid between *O. Aquifolium* and *O. fragrans*.

O. fragrans, a Chinese species, recognized by its broadly ovate or oval leaves, with spiny margins and its large white fragrant flowers, can be grown in Cornwall, but is too tender for border cultivation in the neighbourhood of London.

Within recent years two new species have been received from Western China. *O. armatus* is described as growing upwards of 12 feet high in its native country. The thick oblong leaves are sometimes 6 inches by 1½ inch, dark green, and edged with spines; the fragrant white flowers are borne in autumn. *O. Delavayi* found in Yunnan, is said to attain 6 feet in that country, although it grows slowly here. It is distinct from other kinds by having its fragrant white flowers produced from the points of the branches as well as from the axils, in spring.
H. R. D.

Peas, Culinary, On the Genetics of "Rogues" among. By W. Bateson and C. Pellew (*Jour. Gen.* v. July 1915, pp. 13–36; plates).—Rogue peas are characterized by narrow leaves, stipules, and petals, leaves stiffer and harder than the type, and narrower curved pods, while the seeds are said to be less sweet than the types. They occur in many varieties, and their presence is not to be accounted for either by accidental admixture or by crossing. Rogues occurring in stocks of 'Early Giant' and 'Duke of Albany' were mainly investigated. The problem of the reason and incidence of their occurrence is at present unsolved, but the following facts have come out:—

1. Thoroughly typical plants occasionally throw rogues and certain intermediate forms.
2. The rogues, of whatever origin, when fertile (as they usually are), have offspring exclusively rogues.
3. Intermediates (raised from types), showing combinations of type and rogue characters, give mixed families of various compositions.
4. Crosses between types and rogues, however made, have (with rare exceptions) always given rogues, though these in their juvenile condition are generally type-like; and these rogues have always given rogues.

Strict and constant elimination of the rogues will reduce the number in a strain, but at present there seems no way of completely eliminating them.—*F. J. C.*

Peat Rock Gardens. By Murray Hornibrook (*Garden*, April 18, 1915, p. 192, and June 6, p. 295).—The author gives an interesting account of how he was led to substitute slabs of peat for stone in his rock garden, with happy results. He describes the peat slabs employed, which must be large blocks of the top spit full of heather roots to keep them together, and about a yard square. He gives a long list of plants that have succeeded with this method.—*H. R. D.*

Phosphate, Availability of, to Various Crops. By H. L. Russell (*U.S.A. Exp. Stn., Wisconsin, Rep.* 1913; pp. 22 and 23).—Ten kinds of plants were grown under greenhouse conditions, the necessary phosphate being supplied in eight different forms. The plants showed striking differences in their ability to secure and use phosphorus from these various sources. Nine of the ten plants tested responded better to aluminium phosphate than to calcium phosphate, the latter giving inferior results to ferric phosphate in six cases, thus showing the inadequacy of chemical solvents in measuring the availability of different phosphates.—*A. P.*

Pines, A Disease of, caused by Cronartium pyriforme. By Geo. G. Hedgcock and Will. H. Long (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 247, July 1915, pp. 1–20; 1 fig., 2 plates).—This fungus produced three kinds of spores, and has two distinct hosts—the Pines and Comandra plants. The process of infection in this rust is similar to that in the White Pine Blister Rust. To control the disease, the destruction of the Comandra plants is suggested, as these serve as a host carrying the æciospores of the fungus.—*A. B.*

Plum Trees, On Diseases of. By W. N. C. Belgrave (*Ann. Appl. Biol.* ii. July 1915, pp. 183–194; figs.).—A disease of plums in which the ends of twigs die back was investigated, and a species of *Cytospora* allied to if not identical with *C. leucostoma* was isolated. The fungus was studied and inoculation experiments were attempted, but with negative results.—*F. J. C.*

Pollination in Orchards (Bestuiving en Vruchtbaarheid van Ooftboomen). By M. C. Goethals (*Maandblad der Ned. Pomologische Vereeniging te Utrecht*, 1915).—A general review of some of the literature on pollination in orchards together with a summary of certain investigations in parthenocarpie and development of fruit flowers. This is followed by an account of results obtained by cross- and self-pollination of certain varieties of apple, pear, and cherry. Apple 'Winter Golden Pearmain' set few fruits when self-pollinated, but set well with 'Cox's Orange Pippin' and 'Golden Reinette.' 'Cox's Orange Pippin' set no fruits when selfed (9 flowers only), but set with 'Winter Golden Pearmain' and 'Golden Reinette.' 'Golden Reinette' proved slightly self-fertile, and set well with 'Cox's Orange.' 'Ernst Bosch' set none when selfed, but set with 'Cox's Pomona.' 'Bellefleur' proved self-fertile and also set with 'Lentsche Roodge' and 'Sterappel.' Pear 'Beurré d'Amanlis' gave no fruit when selfed, but 'Durondeau' was self-fertile (and under these circumstances seedless, as in our own experiments).—*F. J. C.*

Potato, A New Species of Colletotrichum on. By P. J. O'Gara (*Mycologia*, vii. Jan. 1915, p. 39).—This fungus attacks stems, mostly underground, of the potato. At times definite dark-brown or black cankers are produced, but often the whole underground stem is involved. The name *Colletotrichum solanicolum* is suggested for it, and it is said to be common in the Salt Lake Valley, Utah.—*F. J. C.*

Potato Diseases, Investigations on. By G. H. Pethybridge (*Jour. Dep. Agr. and Tech. Inst. Ireland*, xiv. April 1914).—Investigations upon the relative efficiency of powder sprays and liquid sprays against the ordinary potato disease were continued and the conclusion arrived at that the powder sprays were inferior. The result of a single experiment appears to show that spraying with copper salts had no appreciable effect upon the crop (apart from the effect of limiting the disease). Sclerotium disease is, next to "blight" (*Phytophthora infestans*), the most prevalent potato disease in Ireland. It is due to *Sclerotinia sclerotiorum*, and is contracted from air-borne fungus spores which are produced by sclerotia which rest in the soil, and is therefore indirectly contracted from infected soil. Affected stems fall over prematurely and the yield is seriously diminished, but the tubers are not themselves attacked. No spraying method has been found to check it, but the number of plants affected is greatly reduced by late planting (mid-June); this also unfortunately reduces the crop very considerably. "Pink rot" (*Phytophthora erythroseptica*) has been found to

produce a wilt disease affecting the plant as a whole as well as the pink rot of the tuber. This disease has been shown to be contracted directly from the soil.—*F. J. C.*

Potato, Leaf-roll Disease. By J. G. Grossenbacher (*Phytopathology*, v. June 1915, pp. 157–160).—Reviews and approves Quanger's investigation on the death of the phloem in cases of potato leaf-roll.—*F. J. C.*

Potato, Leaf-roll Diseases. By O. Appel (*Phytopathology*, v. June 1915, pp. 139–148).—Leaf-roll is due to interference with the water supply, brought about by various causes. Curly dwarf is characterized by shortened internodes and curly leaves due to the shortening of the midribs; the stems are brittle and the leaves often remain small; the yield is small, and the tubers produce diseased plants. Streak is somewhat similar, but is characterized by black streaks on the stems and leaf veins, and frequently by black spots on the leaves; it is supposed to be of bacterial origin but its real cause remains to be discovered. Leaf-roll is characterized by the upward and inward rolling of the potato leaves without undulation of the leaf-margin; the leaves are usually discoloured, yellowish green, reddish, or even violet, the intensity of the discoloration depending upon the weather; the haulms are shorter and more erect, the flowers, leaves, and berries are smaller than normal; the yield is usually small, and the tubers produce diseased plants; the tubers rarely decay; the phloem is diseased and enzyme action slow; the cause is unknown, though it is intensified by certain climatic conditions. Parasitic leaf-roll disease (or vascular mycosis) is due to the attack of species of *Fusarium oxysporum* or other *Fusarium*, or of *Verticillium alboatrum*; it is distinguished from the non-parasitic leaf-roll diseases by the top leaves withering first, and by the presence of brown spots in the vascular bundles and mycelium in the tissues; the tubers do not all become infected. Bacterial ring-disease is also sometimes characterized by leaf-rolling; it is due to *Bacterium sepedonicum*; the spiral vessels are filled with the bacteria which secrete enzymes which dissolve the walls and produce cavities; the pitted vessels are free from them; the disease is most marked in dry seasons when the leaves begin to die from the edge inwards. Foot disease may be due either to *Rhizoctonia solani* when the progress of the disease is slow or to various bacteria which soften and often quickly blacken the stem at the point of attack, as *Bacterium phytophthorum*, *B. atrosepticum*, *B. solanisaprum*, and *B. xanthochlorum*.

The following table is given to differentiate the diseases:—

- I. Crisp leaves:
  - 1. Curly dwarf disease.
- II. Rolled leaves:
  - 1. Non-parasitic:
    - A. Leaf-roll disease.
  - 2. Parasitic:
    - A. Vascular diseases:
      - *a*. Fungi—Wilt disease.
      - *b*. Bacteria—Ring disease.
    - B. Foot diseases:
      - *a*. Fungi—Rhizoctonia disease.
      - *b*. Bacteria—Black-leg.

—*F. J. C.*

Potato Spraying (*Queensland Agr. Jour.* Sept. 1914, pp. 233–239).—Requires to the acre about 16 lb. quicklime and 12 lb. copper sulphate for each spraying; the latter costs about 32*s*. per cwt.—*C. H. H.*

Potatos, Curly-Dwarf, Oxidases in. By H. H. Bungel (*Jour. Agr. Res.* ii. Aug. 1914, pp. 373–404).—The author, using the method of oxidase measurement he had devised, finds the oxidase activity of normal potato foliage greatest in its youth, after which it falls off, to rise again about the time the plant ceases to grow. Curly-dwarf potatos show greater oxidase activity than normal healthy ones both in the juice of their tubers and in that of their foliage.—*F. J. C.*

Potatos, The Spindling-Sprout Disease of. By F. C. Stewart and F. A. Sirrine (*U.S.A. Agr. Exp. Stn., New York, Bull.* 399, March 1915, pp. 133–143; 3 plates).—In 1914 numerous small weak potato plants with very slender stems were noticed on Long Island. On investigation, these weak plants had developed from tubers which had produced slender thread-like sprouts. It was thought that it was due to the weakened conditions of the seed tubers. The name "Spindling-Sprout" is suggested for this disease, the cause of which is not definitely known, though, no doubt, drought and excessive heat are factors in

its production. It occurs chiefly upon southern-grown seed potatos, and it is suggested that growers should use only northern-grown tubers as seed, since they are not apparently affected by the disease.—*A. B.*

Reclamation of an Unproductive Marsh Soil in Kanaker Region (*U.S.A. Exp. Stn., Purdue, Bull.* 170, vol. xvii. Dec. 1913; 22 illus.).—The addition of ground limestone, at the rate of 4 tons to the acre, rendered the unproductive lands reproductive.

It was discovered during the experiments that nitrification went on in the unproductive lands, although excessively acid, at nearly the same rate as in the others, but the leached water extracts contained large proportions of aluminium nitrate. Aluminium had therefore been acting as a base.

Although the nitrate contents were almost equally high in the unproductive soils, corn could not be profitably grown, so that it was thought that some other factor determined the matter.

A series of experiments were then carried out with water cultures containing suitable nutrients, and in the results it was found that quite dilute solutions of aluminium nitrate had a toxic action on plants, but the addition of calcium carbonate in excess nullified their action.—*C. P. C.*

Rock Garden in Autumn. By E. H. Jenkins (*Garden*, Sept. 5, 1914, p. 445).—While the greater flower wealth of the rock garden is found from March to June, the writer notes an increasing desire to extend the flowering season as much as possible. He suggests selecting from the genus *Campanula* such forms as *fragilis, isophylla, Barrelieri, Stansfieldi, garganica* in variety. In addition there are the hardy Heaths of importance and beauty, Crocus species in considerable variety, hardy Cyclamen, Polygonums, Sedums, Colchicums, Sternbergias and Zauschnerias, all which should be planted with freedom; *Saxifraga Fortunei*, could be made a feature, and the Violettas are worth specializing in. The more profuse-flowering alpines, such as *Androsace lanuginosa* or *Campanula muralis*, not infrequently provide a secondary display, and carpeting subjects should not be neglected, especially for preserving the Crocus flowers when in blossom. The writer adds a schedule of suitable subjects, with their height, aspect, colour, and other particulars.

There are other articles on the same subject by K. L. D., *Garden*, November 28, 1914, p. 578, and by Alva J. Hall, December 12, 1914, p. 595.—*H. R. D.*

Roses, Banksian, How to Make them Flower. Notes by Alice S. Rolfe, Mary C. Bond, Rev. F. C. Dutton, and E. Tring (*Garden*, Dec. 19, 1914, p. 605).—The writers of these notes agree on the whole in finding the desired result attained by growing the plants in poor soil and letting them run practically wild.—*H. R. D.*

Roses, Cotoneaster as a Stock for. By C. Turner (*Garden*, Aug. 1, 1914, p. 386).—The writer records an instance of a Rose 'William Alan Richardson,' eleven or twelve years old, budded on a stock of *Cotoneaster Simonsii*.—*H. R. D.*

San José Scale. By H. T. Fernald (*U.S.A. Exp. Stn., Mass., Ann. Rep.* Jan. 1914, pp. 57a and 58a).—An active and efficient parasite on this pest has been discovered. In 1913 it was extremely abundant, in some cases parasitizing over 90 per cent. of the scales in the branches of the plants examined.—*A. P.*

Saxifraga Boydii, A White Sport of. By E. Heinrich (*Garden*, March 28, 1914, p. 155).—More than fifteen years ago the author reported that a specimen plant of *S. Boydii* had suddenly yielded white flowers in some parts of the tuft. With this change to white also resulted the more robust growth of the var. *alba*, which it resembled in every respect. The author rejects the possibility of a shred of the white variety having got into the cushion, and has had further proof that it must have been a sport. The previous autumn (1913) he divided a large clump of *S. Boydii* into 250 plants. A number of these bore yellow blossoms, but one offset with two rosettes bore a pure white flower on one, the other remaining barren.

Ib. By E. H. Jenkins (*Garden*, May 2, 1914, p. 214).—The interest of the case referred to by M. Heinrich centres in the fact that the raiser of *S. Boydii* first stated that it resulted from two white-flowered sorts, *S. Burseriana* and *S. Roebeliana*, and it was not till the plant flowered at Kew some years later that the parentage *S. Burseriana* × *aretioides* was suggested. The author considers that in *S. Boydii alba* there is nothing to suggest either *S. Burseriana* or *aretioides* influence, but much to suggest such a combination as *S. Burseriana* and *Roebeliana*.
H. R. D.

Saxifraga Burseriana and its Varieties. By E. Heinrich (*Garden*, April 11, 1914, p. 179).—The author considers that the form which occurs on the heights round the city of Trient, in the Southern Tyrol (hence *tridentina*), is *S. B. major*, while the form found on the Swiss mountains is *S. B. minor*, the former being of a looser habit of growth and with larger rosettes and flowers. The Swiss form is also distinct in its deeper-coloured flowers and calyces. There is a third form on the mountains of Northern Tyrol intermediate between the two in character. Mr. Negus having stated on p. 143 (March 11, 1914) that *S. B. gloria* does not come true from seed and that his specimen bears two and possibly three flowers on one stem, the author considers that this points to the probability of *S. B. gloria* being a hybrid, for even twin flowers are extremely rare on either of the species. But for this multiple inflorescence, *S. B. gloria* might still be considered as selected as a giant variety of the *tridentina* form, for there are great differences in the size of the flowers in individual plants as they occur in nature. In some the petals are so narrow at the base as to leave open spaces between them, as in *S. granulata*, while others have rounded petals often overlapping each other. *S. B. minor* has generally overlapping petals, and the author has a form with crenated petals.

Ib. by E. H. J., May 2, 1914, p. 215.—The author distinguishes *S. B. major* from *S. B. gloria*, *major* being characterized by large sparkling white flowers, the petals having crenated margins and a meadow-sweet fragrance, the plant spreading laterally and not forming tufts, *S. B. crenata* being similar but not so good; *gloria*, on the other hand, has considerably larger flowers than *major*, but flimsy in texture and dead white, without the glistening surface of *major*, while the plant forms a densely-cushioned tuft. In size the flower is only surpassed by *magna*, also of cushion growth, while *S. B. speciosa* has the smallest rosettes and is latest to flower.—*H. R. D.*

Seaweed for Manure (*Jour. Dep. Agr. Vict.* Oct. 1914, p. 634).—Seaweed, which is plentiful on some coasts, forms a cheap and valuable manure.

The composition varies with the variety, but the following may be taken as the approximate analysis :—

Water	80	per cent.
Organic matter	10–20	,,
Nitrogen	·3–·73	,,
Potash	·3–1·9	,,
Phosphoric acid	·1–·5	,,

From the above analysis it will be seen that seaweed is comparable as a manure with farmyard manure, being, however, slightly deficient in phosphates. It has the advantage of being free from weed seeds.—*C. H. H.*

Silver-leaf Disease, A Contribution to our Knowledge of. By J. Smolák (*Ann. Appl. Biol.* ii. July 1915, pp. 138–157; figs.).—The author has investigated the characters of cells of leaves of plum attacked by the silver-leaf disease, and finds the differences are much more profound than has been suspected and involve the nucleus as well as the separation of the epidermis from the underlying cells. He finds the cells resemble those of galls, and questions the validity of the evidence which has associated *Stereum purpureum* with the disease as cause and effect. The fungus, he states, has not been observed in the leaves, and he believes some toxin is secreted in or near the cells which are modified, not in a remote region such as the stem.—*F. J. C.*

Snails (*Queensland Agr. Jour.* July 1914, p. 80).—Snails lay their eggs in heaps of dead leaves, and these hatch out in from twenty-five to thirty days. In the State of San Paulo they are captured by hand, and the high-growing plants most subject to attack are surrounded by a rope of tarred piassava. Low-growing plants are sprayed with a 4 per cent. solution of copper sulphate, and pasture lands with a 1 per cent. solution of bay salt. Ducks and crows readily devour them. The glandinas, or carnivorous snails, will devour from fifteen to thirty of the pests a day, and have been successfully introduced into the south of France and into Tunis.—*C. H. H.*

Soil Bacteria, Culture Media for Use in the Plate Method of Counting. By H. Joel Conn (*U.S.A. Agr. Exp. Stn., New York, Tech. Bull.* 38, Nov. 1914, pp. 1–34).—This paper details the various culture media used in the bacteriological analyses of soils. The author recommends two new culture media: the soil extract gelatine (described in previous abstract) and the sodium asparaginate agar. The advantages of the asparaginate agar are that it contains no

substance of indefinite composition except the agar itself, and thus it is specially adapted to quantitative work. The soil extract gelatine is more suitable for qualitative work, and is recommended as a preliminary medium in the study of soil bacteria.

Four other media have been compared with the above. They are those media recommended by Fischer, by Lipman and Brown, by Temple, and by Brown. They are all distinctly inferior to gelatine for qualitative purposes, while for quantitative purposes they are unsuitable, because they contain substances of indefinite chemical composition.

It has, however, been found that no one of the five agar media has a distinct advantage over any of the others in the matter of the total counts obtained by their use.—*A. B.*

Soil Bacteria, Influence of, on Plant Growth. By H. L. Russell (*U.S.A. Exp. Stn., Wisconsin, Rep.* 1913; pp. 19–21).—Pure cultures of various kinds of soil bacteria grown in extracts from marsh soil previously cropped to corn, oats, or clover, in all cases showed increased bacterial development, this being greatest in the soil cropped to corn. The extracts from cropped loam and sandy soils, on the contrary, invariably retarded bacterial development. It was also found that the growth of different kinds of soil bacteria in a previously sterilized soil produced changes which in some cases increased, and in others decreased, the growth of plant seedlings when grown in extracts from these soils. It is thought that some new light may be thrown on the complex processes concerned in crop rotation.—*A. P.*

Soil, Bacteria of Frozen. By H. Joel Conn (*U.S.A. Agr. Exp. Stn., New York, Tech. Bull.* 35, July 1914, pp. 1–20; 4 graphs).—As a result of his experiments the author deduces the following:—

1. The number of bacteria in frozen soil is generally larger than in unfrozen soil. This is true not only of cropped soil, but also of sod and fallow soils.
2. The increase in the number of bacteria after freezing is not due to the increase in soil moisture which usually occurs in winter.
3. The same increase in germ content may take place in potted soil, where there is no possibility that the bacteria are carried up mechanically from lower depths during the process of freezing.
4. It is probable that an actual growth of bacteria occurs when the soil is frozen. The influence upon fertility is still an unknown factor.

The methods employed were as follows:—Soil samples were obtained by boring 6 inches and were then thoroughly mixed by sifting or stirring if dry or muddy. ·5 grm. of the sample was then shaken up with 100 c.c. of sterile water and a series of dilutions, 1 : 100,000 and 1 : 200,000 or 1 : 200,000 and 1 : 500,000, were sown on a gelatine plate.

The medium used was gelatine 12 per cent., soil extract 20 per cent., dextrose ·1 per cent., and adjusted to ·5 per cent. normal acid to phenolphthalein.

To obtain the soil extract, soil was heated for one hour at atmospheric pressure, then mixed with an equal weight of cold water, allowed to stand overnight, then boiled for half an hour and filtered.—*A. B.*

Soil Moisture, The Storage and Use of. By W. W. Burr (*U.S.A. Exp. Stn., Nebraska, Research Bull.* 5, March 1914; *Bull.* 170, July 1914; 15 charts; 4 illus.).—The above research bulletin probably comprises the most exhaustive work of its kind that has so far been carried out, to determine the factors that control soil moisture. In the results it is suggested that autumn tillage, after crop has been removed, would prove very beneficial in retaining the soil moisture for another season.

Although not recommended under all conditions, the making and retention of a soil mulch during growing season is strongly recommended, but under all conditions the removal and destruction of weeds is insisted on as necessary to allow a crop to grow into proper maturity during dry weather.

Incidentally it is mentioned that oats, spring wheat, barley, and corn will seek water to a depth of 6 to 7 feet, perennial grasses to an even greater depth, while alfalfa will go down to natural water level to seek water at depths of 20 to 30 feet.—*C. P. C.*

Soil Sterilization, Methods of, for Plant Beds and Greenhouses. By A. D. Selby and J. G. Humbert (*U.S.A. Agr. Exp. Stn., Ohio, Cir.* 151, Jan. 1915, pp. 65–74; 2 figs.).—The methods of soil sterilization are essentially three in

number: (1) the perforated pipe method of steam sterilization; (2) the inverted pan method, using steam; (3) the formaldehyde or formalin drench method.

The perforated pipe method of steaming consists of a set of perforated pipes with crosshead and high-pressure boiler connection. The pipes are buried in the soil and the surface covered with canvas. Steam is now passed into the pipes and so into the soil for about an hour. The temperature of the soil is raised to 180°–212° F. The size of the buried pipes is 1½ inch.

The inverted pan method was originally used in Florida for nematode-infected soils. The apparatus is a galvanized iron pan, 6 inches deep by 6 feet by 10 feet, and this is inverted over the soil to be sterilized and steam admitted under pressure.

The formaldehyde drench method. The appliances used are various, though usually some form of sprinkling can, or a force pump with hose and nozzles, are used.

The relative cost for treating (say) 3,000 sq. feet is $15.40 by the perforated pipe method; $12.20 by the inverted pan method; and $21.00 by the formaldehyde drench method.—*A. B.*

Sugar Beet, Leaf-spot Disease of. By C. O. Townsend (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farm. Bull.* 618, pp. 1–18, Oct. 1914; 10 figs.).—Leaf-spot disease of the sugar beet (*Cercospora beticola*) is a widely-distributed fungus in the States of America. By attacking and destroying the leaves of the growing crop, the plants are unable to mature and are frequently deficient in sugar. The best methods for the control of disease include a carefully-planned and thorough system of crop rotation and a systematic spraying with Bordeaux mixture (4–4–50) on the first indication of the fungus. A constant and uniform supply of moisture is also of value in reducing and retarding the developmen of "leaf-spot."—*A. B.*

Sulphur in Plant Nutrition. By H. L. Russell (*U.S.A. Exp. Stn., Wisconsin, Rep.* 1913; pp. 18 and 19).—In greenhouse trials on soil containing ·04 per cent. of sulphur trioxide it was found that such high protein and sulphur plants as rape, radishes, turnips, and clover, responded in a marked degree to the application of a sulphate fertilizer, clover yielding 35 per cent. increase in dry matter, where gypsum had been added to a so-called complete fertilizer, and containing an abundance of sulphates in the sap, whereas on a soil where no sulphate had been applied the plants contained absolutely no circulating sulphates, showing that the growth of the plants was being limited because all the sulphates obtained by the plants from the soil had been built up into organic plant compounds.—*A. P.*

Tobacco, Black Rot, Shed Burn, and Stem Rot of. By James Johnson (*U.S.A. Agr. Exp. Stn., Wisconsin, Research Bull.* 32, June 1914, pp. 63–84; 7 figs.).—This paper describes various experiments to determine the causal organisms of the above diseases of tobacco.

1. *Black Rot* is a disease of the tobacco leaf and occurs during the fermentation process. The rot is due to the development of the fungus *Sterigmatocystis nigra* on the leaves, causing them to blacken and decay. The disease is primarily due to excessive moisture and a temperature of 30° to 40° C. following infection by the fungus. Thus the control of the black rot disease must depend largely on the regulation of the percentage of moisture in the leaf and the temperature of fermentation.

2. *Shed Burn and Stem Rot* of tobacco may be due to one or more species of saprophytic fungi. *Fusarium* is most commonly the cause of these diseases in Wisconsin. The difference between the two diseases is chiefly one of location. If the fungus attacks the midrib, the disease is called stem rot; if the leaf tissue is attacked, the disease is called shed burn.

To control these diseases, the regulation of the temperature and moisture in the curing shed is of supreme importance.—*A. B.*

Tobacco, "Calico" of, Chlorosis of Plants with Special Reference to. (*U.S.A. Agr. Exp. Stn., Conn., Report of Stn. Botanist, G. P. Clinton, Sc.D.*, 1914, pt. vi., pp. 357–448; 8 plates.)—"Calico" disease of Tobacco is primarily a disease of the chlorophyll of the plant. Thus the normal nutrition of the plant suffers, and the attacked plants present a stunted appearance and bear mottled yellow and green leaves, more or less wrinkled. The disease is infectious and to some extent contagious, and takes from ten to fourteen days to incubate. "Rust" is frequently associated with this disease, usually on the fully-grown leaves.

Chlorosis or "Calico" of Tomato is the same as the "Calico" of Tobacco, and can be easily transferred from one host to the other. Further, other species of *Nicotiana* are susceptible to the disease. Pure "Calico" juice (*i.e.* the juice expressed from "calicoed" leaves) is much more potent than when diluted with water. A small quantity is capable of infecting a healthy plant. The "virus" appears to renew itself in the tissues of the living plant; and appears to be of the nature of an enzyme, which is destroyed by heating, may be filtered through a Berkefeld filter and readily extracted by ether, chloroform, or alcohol without losing its infectious character. The "virus" may be preserved for a long time by the addition of a small amount of toluol. Experiments with the auto-digestive enzyme of *Coprinus* sp. as to the possibility of cure or prevention of "calico" in tobacco gave negative results. Apparently it has no inhibitive or curative action upon the infectious enzyme of "calicoed" tobacco.

A fairly complete list of literature on this subject is appended to the report.

A. B.

Tobacco Hornworms, Arsenate of Lead as an Insecticide against, in the Dark Tobacco District. By A. C. Morgan and D. C. Parman (*U.S.A. Dep. Agr., Farm. Bull.* 595, June 1914).—Arsenate of lead (diplumbic), applied in powder form as a remedy against hornworms, proved superior to Paris green, giving an increased mortality and no burning of foliage. On the other hand, although cheaper in first cost, Paris green always damaged the plants by burning the leaves, the losses from this cause alone ranging from 4 to 20 per cent.

Arsenate of lead, even in the face of heavy rains, will remain operative for some days, while Paris green would need to be again sprayed on the plants.

Dose suggested, 3½ to 5 lb. to the acre.—*C. P. C.*

Tomato, Heredity of Types of Inflorescence and Fruits in. By M. B. Crane (*Jour. Gen.* v. July 1915, pp. 1–10; plates).—Two types of inflorescence are recognized: the compound, as seen in 'Wonder of Italy' and 'Buck's Tresco,' with a large, much-branched inflorescence, bearing flowers and fruits in all stages of development, the inflorescences usually occurring at intervals of six nodes; and the simple form, in which only about nine flowers occur, and only three nodes intervene between the inflorescences. In F_1 all the plants of these two forms crossed had simple inflorescences, while the usual 3 : 1 segregation occurred in F_2, the compound type coming true in F_3.

Correlation was found between the shape of the fruit and the number of loculi, the long fruits ("long" is recessive) being usually bilocular, the round plurilocular. Many Mendelian characters are apparently involved in the fruit shape, the elucidation of which requires further work.

In some forms sterility of anthers occurred, but usually the plants are self-fertile, and, from the relative positions of anthers and stigmas, not readily crossed. Parthenocarpic fruits (usually entirely without seeds) occurred in forms with contabescent anthers devoid of pollen.—*F. J. C.*

Tomatos, Fertilization Experiments with. By Arthur L. Dacy (*U.S.A. Exp. Stn., W. Virginia, Bull.* 142, Nov. 1913).—The author suggests the addition of a complete fertilizer containing

75 lb. nitrate soda		75 lb. nitrate soda.
200 lb. acid phosphate	or	150 lb. steamed bone.
80 lb. muriate potash		80 lb. muriate potash

as giving the best results on outdoor tomatos when added at the rate of 400 lb. to the acre. Judging from British standards, however, the yields at the best seem very low, averaging only about 150 bushels to the acre.—*C. P. C.*

Tomatos, Strain Tests for. By C. E. Myers (*U.S.A. Exp. Stn., Pennsylvania, Bull.* 129, March 1914; 12 pp.).—This bulletin gives the results of three years' experiments instituted for the purpose of determining the relative values of strains of tomato seed when secured from different sources. There were variations in yield amounting to as much as thirteen tons an acre, differences which are attributed not to environmental conditions, but to the heredity. It is suggested that seed should be secured a year in advance of the time when it will be needed for general planting and submitted to a preliminary test, as in this way, by securing several strains, it could be learned which would be the most desirable for use the following year.—*A. P.*

Transplanting Vegetable Seedlings (*Queensland Agr. Jour.* Oct. 1914, p. 280). —The soil to be planted should be fine, not hard and lumpy. When taking

up the plants from the seed-bed, be careful not to break the roots too much, and endeavour to lift them with a little of the soil adhering. Give the bed a thorough soaking with water some time before beginning to lift the plants. Choose a dull or showery day for transplanting, but, should the weather be warm and dry, do the work in the afternoon, and water well after planting. Set the plants a little deeper in the ground than they were in the bed. Make the hole for planting just deep enough so that the plant will not hang in it. Should the weather be dry for some time after planting, water the plants several times a week until they become established, the watering being done either early in the morning or late in the afternoon. Mulching with stable manure, grass, or litter of any kind saves a great deal of watering or hoeing and prevents the ground from baking after watering, keeps the temperature of the surface soil more equal, and promotes root-action.—*C. H. H.*

Walnut, Interpollination. By C. F. Cole (*Jour. Dep. Agr. Vict.*, April 1915, p. 246).—For practical purposes, where interpollination is required, planting the trees in close proximity to one another should be carried out, as little is known as to the distance the pollen will travel.

It is no uncommon thing to see walnut trees producing each year catkins (staminate blooms) in abundance and practically no pistillate (female) blooms, also trees producing pistillate and no staminate blooms.

Many walnut trees during the early stages of growth have a tendency to produce female blooms alone, but, as they grow older, eventually produce catkins (male blooms) in sufficient quantity. To be of any commercial value, the tree should yield both staminate and pistillate blooms, particularly the latter, in quantity. The planting of a grove with different varieties that bloom partially or completely at or about the same time is a wise precaution. The interchange of pollen from one variety to another is probably beneficial, if not at times essential, particularly if the staminate blooms should happen to be sterile upon any one variety during any particular season, a thing that may probably occur.—*C. H. H.*

Walnut, Propagation of. By C. F. Cole (*Jour. Dep. Agr. Vict.*, July 1915, pp. 437–439).—As a stock for the English walnut, the English seedling as a rootstock has been practically discarded in California; the nurserymen now use the indigenous black walnuts, and hybrid seedlings raised from nuts. These hybrid nuts are secured from trees influenced by the exchange of pollen between two species of walnuts growing in close proximity to one another. The crosses between the American black are named royal hybrids, those between the black and English varieties paradox hybrids. The Californians find that the black and hybrid rootstocks will stand unfavourable conditions better than the English seedling. Selected English varieties, on the other hand, are more prolific, and generally come into bearing earlier than when worked upon their own seedlings. Some trees, five years planted in the grove, produced from 12 to 20 lb. of nuts. Experiments were carried out in California by grafting the selected variety (Placentia Perfection) upon different rootstocks, such as the North Californian black, English, and Paradox. The result was in favour of the Paradox root, the tree at four years old being twice as large as that upon the English root, and much larger than the tree upon the North Californian black root. All these trees were grafted and planted out at the same time, and were of uniform size, growing adjacent to one another, and under uniform conditions. That the production of nuts is proportionate to the size of the tree is shown by the crop in 1911; the tree upon the Paradox root produced 18½ lb., that upon the North Californian black root 12½ lb., and that upon the English root, 9 lb.

Californian experiments seem to prove that only the first generation seedlings, that come directly from black walnuts which have been cross-fertilized with pollen of the English walnut in the Paradox, and royal hybrids, are suitable for rootstock purposes. The first generation of nuts in some seasons produce from 40 to 50 per cent. of hybrids. The second generation Paradox seedlings——that is, seedlings grown from nuts gathered from hybrid trees—are unsuitable for the English varieties, such rootstocks producing trees lacking in any unusual vigour.

When procuring nuts of any species for growing rootstocks, they should be secured from well-matured trees of thrifty and vigorous habit.

The hybrid rootstocks are highly spoken of in California, the royal hybrid being particularly adapted for wet and heavy soils, and even doing well upon drier soils, or without irrigation; there is very little likelihood of these hybrid

rootstocks being largely used by the nurserymen there, owing to a very uncertain percentage of hybrid trees developing in the nursery from nuts gathered from trees subject to the influence of interpollinations, and, in addition, it requires special knowledge to separate these hybrid roots from those of the black species.—*C. H. H.*

Water Requirements of Plants, Relative. By L. J. Briggs and H. L. Shantz (*Jour. Agr. Res.* iii. Oct. 1914, pp. 1–64; plates).—A large number of experiments are recorded designed to ascertain the relative amounts of water required by different plants in order to maintain their growth and reach their full development. The amount of water required by different varieties of the same species varies enormously, and it is hoped that in this direction success may be obtained in raising strains of plants of economic importance for cultivation in dry districts.—*F. J. C.*

Whitewash. (*Queensland Agr. Jour.* Feb. 1915, p. 69.)—A cheap limewash which will stand the rain and weather without coming off, and that will do for galvanized iron, is made as follows:—Place enough tallow in a large bucket, then lay about the same quantity of good lime (dry) on top of the tallow—i.e., equal proportions of each; then pour enough water on to slake the lime. When the heat from the lime has melted the tallow, and all is well dissolved, stir it thoroughly until all is well mixed; then apply (warm if possible) with a large brush. This will do for any surface. The surface must be quite dry before applying the mixture. If required to dry very white, add a small quantity of blue.—*C. H. H.*

Wood Preservation, The Toxicity to Fungi of various Oils and Salts, particularly those Used in. By C. J. Humphrey and R. M. Fleming (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 227, Aug. 1915, pp. 1–38; 4 plates).—The principal preservatives for wood are coal-tar creosote and zinc chloride, either alone or in combination. It is only within the past decade that laboratory tests to determine the relative toxicity of substances adapted particularly for wood preservation have been undertaken. The problem has been attacked in two ways:—

(1) By mixing the preservative under consideration with various types of culture solutions solidified by the addition of agar or gelatine, and inoculating with the organisms desired, and (2) by injecting the preservative into wood and then exposing the blocks thus treated to the action of wood-destroying fungi. These tests were first suggested by Malenković in 1904.

The authors carried out a number of experiments, using the Petri dish method and agar media, and also injecting the preservative in wood and exposing to the destructive fungi. The cultures were grown satisfactorily on beef malt agar, slightly acid. The fungi used were *Fomes annosus* Fr. and *Fomes pinicola* (Sw.) Fr., while the preservatives tested were coal-tar creosote, sodium fluoride, cresol calcium, zinc chloride, water-gas tar, wood creosote, hardwood tar, avenarius carbolineum, copperized oil, &c.

The conclusions drawn were:—

The action of toxic agents appears to be specific, being highly poisonous to certain organisms, but only moderately so to others. Very dilute concentrations ordinarily produce a stimulative effect. The common moulds are more resistant to poisons than the true wood-destroying fungi.

The chemical and physical composition of the media supporting the growth of the fungi determines, to a large extent, their development.

Toxic elements or radicals are often difficult to determine. In heavy metallic salts it is the metal ion; in strong inorganic acids the hydrogen ion is said to be the important element; in certain phenols the introduction of halogen, alkyl, or nitro groups is said to increase toxicity.

The results of the tests show that *Fomes annulosus* Fr. is more resistant to the preservatives than *Fomes pinicola* (Sw.) Fr. There is a short bibliography appended.—*A. B.*

Xenia, Heredity of, in Certain Races of Beans. By Jean Daniel (*Rev. Hort.* June 1, 1914, pp. 253–27; col. pl. and 7 ill.).—A very interesting account of results of experiments on Mendelian lines, the coloured plate showing effect of crossing on both seed and flowers of the two species concerned.—*C. T. D.*

Xerophily of Ericads in Winter. By Frank Caleb Gates (*Bot. Gaz.* lvii. June 1914, pp. 445–489; 12 figs.).—The author's experiments with *Chamaedaphne, Vaccinium, Andromeda,* &c., show that transpiration proceeded on winter days even at temperatures of − 29°, but was often imperceptible at night.

The leaves of these evergreen Ericaceae were able to absorb water from the atmosphere, especially on frosty nights and at times of high relative humidity. The scale-covered *Chamaedaphne* and *Picea Mariana* absorbed respectively more water (per unit volume of leafy twig) than other evergreens and than *Larix*.

Such absorption is not infrequently three or four times as great as the loss by transpiration during a very cold winter day. Hence the advantage to the plant is great when the ground is frozen solid.

The relative rates of transpiration amongst evergreen Ericads varied in the inverse order of their exposure and of their xerophytic structure. *Chamaedaphne*, the most xerophytic, has the lowest rates of transpiration and of conduction.

In a very severe winter those leaves and branches of this plant which were not covered by snow were killed.

Transpiration appears to regulate both absorption and conduction of water, but only in a general way, and not exactly. The rate of conduction was faster from warm solutions, but was never zero when the solution was frozen; it was much higher in summer than in winter, and was much less in the Ericaceae than in other shrubs or herbaceous plants. The evergreen bog-tree *Picea Mariana* had a lower rate of water conduction than any other tree examined. Transpiration, on the whole, varies with the evaporating power of the air—that is, increases with an increase of temperature, with more movement of air, and with a decrease in relative humidity; it is greater in daylight (perhaps through increased internal temperature).

Many of the author's experiments were carried out with cuttings, though pot plants were generally used. The rate of transpiration was obtained by weighing the plants on a balance sensitive to 0·002 gram.

Light regulates the movements of the stomata of peat-bog plants, but such movements do not control the transpiration of these plants so directly as the evaporating power of the air.

The data regarding the condition of the stomata were obtained by Mollisch's infiltration method (time taken for leaf to become translucent when wetted with xylol).

There are many other interesting points in this paper regarding transpiration &c. of peat plants.—*G. F. S. E.*

WISLEY SCHOOL OF HORTICULTURE.

MANY students have been granted leave of absence during the past year in order that they might join the forces. Only students ineligible for military service are now in attendance, and of the seven who completed their two years' course during the year all but one (rejected on medical grounds) have enlisted. The course of instruction remains as in former years, except that a series of practical lessons on land-measuring have been added. Mr. John Fraser, F.L.S., acted as external co-examiner with the Staff of the School for the School Diploma Examination. All those who entered gained the Diploma, which depends partly upon work done during the two years' course and partly upon the results of practical and written examinations in both principles and operations of horticulture. Their names in order of merit are:

1. Mr. L. C. Edwards.
2. Mr. H. J. Barker.
3. Mr. E. A. Garrett.
4. Mr. A. T. Rudge.
5. Mr. A. Whiteley.
6. Mr. W. H. Streeter.
7. Mr. W. C. Croom.
8. Mr. F. H. V. Wood.

Fifteen students passed the Society's General Examination in March 1915. The following prizes (books) were awarded on the result of the Diploma Examination:

Prizes of the value of 25*s.*, 17*s.* 6*d.*, 15*s.*, and 12*s.* 6*d.* to Messrs. Edwards, Barker, Garrett, and Rudge respectively.

"Nicholson" Prize, of the value of £2 2*s.*, for observations on the Flora and Fauna of the Wisley District, to Lieutenant J. C. Powell, R.F.A.

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PART III.

SOME BOOKS ON ROCK-GARDENING AND ALPINE PLANTS.

By E. A. BOWLES, M.A., F.E.S., F.L.S.

[Read November 9, 1915; Dr. F. KEEBLE, F.R.S., in the Chair.]

* NOTE.—The books marked with an asterisk (*) in this paper may be consulted in the Lindley Library, at the R.H.S. Offices, Vincent Square, S.W.

BOOKS entirely devoted to the subject of Rock-gardening, or the cultivation of Alpine plants, form a comparatively modern section of horticultural literature. The publication in 1864 of Kerner's "Die Cultur der Alpenpflanzen" seems to have opened the floodgates. William Robinson's "Alpine Plants for English Gardens" * appeared in 1870; Sutherland's "Hardy Herbaceous and Alpine Flowers" * in 1871; and Wooster's "Alpine Plants"* in 1872.

This does not mean that no interest was taken in Alpine plants prior to that period, but rather that it was believed to be extremely difficult, if not impossible, to grow many of them in the open air.

We can get a good idea of the use made of Alpines in the early part of the last century from the first edition of Loudon's "Encyclopædia of Gardening," published in 1822. One of the subsections of the chapter on herbaceous plants is headed: "Flowers for ornamenting Rocks, or Aggregations of Stones, Flints, Scoriae formed in imitation of Rocky Surfaces, &c."

An illustration is given showing an appallingly ugly crescent-shaped pile of rough stones; and such horrors are described as well suited to the less durable materials, such as bricks, pudding-stone,

scoriae, &c., and "not so liable to ridicule as imitations of hills, or mountains, or peaks of scoriae in the Chinese manner which are to be seen in some places." In countries abounding in stone, extensive pieces of rockwork with a winding walk or stair and small reservoirs of water for mountain bog plants are considered worth constructing. A list of about 150 plants suitable for planting on these "aggregations of stones" completes the section. These include such weedy plants as *Echium vulgare, Digitalis purpurea, Campanula rotundifolia, Oxalis Acetosella,* and *Physalis Alkekengi*, as well as some that, in spite of all our experience and efforts, still refuse to grow freely—*Bartsia alpina, Aquilegia alpina, Anemone baldensis,* and *Arnica montana,* for instance.

Again, under "Characteristic Decorations," we find, headed *Rocks*: "Plant rockworks are protuberant surfaces or declivities irregularly covered with rocky fragments, land-stones, conglomerated gravel, vitrified bricks and scoriae, flints, shells, spar, or other earthy and hard mineral bodies. Such works are, in general, to be looked on more as scenes of culture than of design or picturesque beauty."

An illustration in Sect. IV. Book IV. shows examples of well and badly laid stones "distributed on the surface to heighten wildness or picturesque beauty." The effect, in all the three combinations, of some squared builders' refuse is very much that of a child's bricks after the tower of Babel has been kicked over and left for Nurse to clear up. In a short paragraph headed *Collecting Wild Plants* we are advised to seek among the tops of snow-clad mountains in winter for *mosses*, and that is all said about collecting in mountains by the great Loudon.

In Miss Amherst's "History of Gardening in England,"* a very short paragraph and one illustration of the rock-garden at Batsford are considered sufficient to deal with the subject of Alpine plants and rock gardens. There is also an allusion to Repton's views as expressed in his "Observations on Landscape Gardening," 1803, stating that the numerous class of rock plants should have beds of rugged stone provided, without the affectation of such stones being the natural production of the soil.

It will, perhaps, prove most useful to examine first some of the more important and interesting of the books dealing with Alpine plants themselves, and belonging to a period prior to this dawn of creation of rock-garden books in the middle of the nineteenth century.

I believe the first list of Alpine plants is to be found in a book of Conrad Gesner's published in 1555, part of which contains a description of Mont Pilatus. Then, in a book by Aretius, "Stockhornii et Nessi, Helvetiae Montium et Nascentium in eis Stirpium Descriptio" (1561), about forty alpines are described for the first time.

Francesco Calzolaris † published in 1566 a short account of plants collected on Monte Baldo, but Giovanni Pona's account of his ascent

† Calzolaris, Fr., *Il Viaggio di Monte Baldo*, &c. Venezia: Vincenzo Valgrisi, 1566, 4.

of Monte Baldo and the plants gathered on the mountain, and also on the road from Verona, is the best known early account of a botanical journey in search of Alpine plants. The dedicatory letter to Clusius is dated 1595, and the book was published in quarto form at Verona in that year, but is better known in the folio edition included in the Plantin Press edition of Clusius' "Rariorum Plantarum Historia" * of 1601. The quotations in Linnaeus' "Species Plantarum" refer to this edition. The list contains a great number of plants, and full descriptions and beautiful woodcuts are given of sixteen of them, and among them are *Phyteuma comosum*, *Trifolium alpinum*, *Ranunculus anemonifolius*, *Silene acaulis*, and *Geranium argenteum*.

"Historia naturalis Helvetiae curiosa," by John Jacob Wagner (1680), contains a section dealing with plants, which is divided into two parts, the first on trees, and the second on sub-shrubs and Alpine plants. But, as Haller points out in the preface to his book, Wagner's list contains scarcely anything beyond names selected from Bauhin, and some absurd species that no one has seen growing wild in Switzerland, such as *Melissa citraria*. But one might expect something of the sort in a book that includes a chapter on Dragons, and gravely divides them into winged and wingless, with a subdivision of the last class into those with feet and those that are footless. Haller's "Enumeratio Methodica Stirpium Helvetiae indigenarum" (1742) is a fine folio and contains twenty-four copper-plate engravings, many of which figure Alpines. *Saxifraga Hirculus*, *Androsace imbricata*, and *Viola calcarata* are easily recognized among them. Allioni's "Flora Pedemontana" (1785) is another important work in three volumes folio, with ninety-two fine copper-plate engravings and good figures of *Primula viscosa*, *Campanula Allionii*, *Ononis cenisia*, *Viola valderia*, *V. cenisia*, and *V. nummularifolia*.

I think the first book entirely devoted to Alpine plants must be one printed at Upsala, 1756, entitled "Flora Alpina," which appears to be a thesis for a degree written by a student under Linnaeus, Nils N. Åmann, but quoted by Pritzel among Linnaeus' works. In it Alps are defined as mountains so high that no trees can grow erect on them, and among a list of Alps those of Britain are enumerated thus: "In Wallia Snowdon et Caderidris, in Jorckschire, Ingleborugh, Hardknor, nec non in Arronia, Westmorlandia, ut & in Scotia, Betack, atque in Hibernia Mangarton, Sligo." We are told that it is not for just anyone to gain a knowledge of Alpine plants, as they are among the rarest, since it is not permitted to behold them without great trouble, journeying on foot through most arduous, rough, and uneven places, in tracts devoid of houses, continually exposed to tempestuous winds, snow, storm clouds, damp, hunger, fatigue, &c. Besides, also, they are rare, because they are scarcely to be met with in gardens; in fact their management would not be known to many gardeners, for it is almost impossible to propagate and keep them in the warmer regions. Then follows a list of those who have written about the Alpine plants of various countries, and lastly lists of plants arranged on the Linnean

system, including five Primulas, five Campanulas, eleven Gentians, twenty-one Saxifrages, one Dianthus, and nine Ranunculus.

Joh. Rudolf Suter produced a 12mo. in two vols. in 1802, entitled "Flora Helvetica, exhibens Plantas Helvetiae indigenas Hallerianas, et omnes quae nuper detectae sunt, ordine Linnaeano." * A much enlarged second edition appeared in 1822, edited by Joh. Hegetschweiler, who added a lengthy preface in German, containing a useful account of Swiss plants, both native and cultivated; copious lists of localities and the floras of the various Cantons; a calendar of times of flowering; and a very good account of the writers, from Gesner in 1555 to the date of writing, who have dealt with Swiss plants, and descriptions of their books.

The main body of the book is arranged on the Linnean system, and its chief value lies in the number of localities given and the records of varietal forms. Thus a white-flowered form of *Solanum Dulcamara* is recorded from Walkenried.

Of course many figures and descriptions of Alpines are to be found in the more general works of Gerard, Parkinson, Clusius, and Dodoens.

Now we turn to books containing coloured figures of Alpines, and first of all must look at Jacquin's "Flora austriaca,"* 1773–8, a grand folio with hand-coloured copper-plates of great beauty, among which are many of our greatest favourites of the Alpine plants. Those of *Primula longiflora*, *P. Auricula*, *P. glutinosa*, and *P. carniolica* are very good, and *Saxifraga Aizoon*, *Cyclamen europaeum*, *Euphorbia Cyparissias*, *Silene Pumilio*, *Potentilla nitida*, and *Dianthus sylvestris* make especially beautiful plates.

Weber's "Alpenpflanzen Deutschlands und der Schweiz" marks the year 1843 as the commencement of a new era in books on Alpine plants; for, to quote from Dr. Kranz's preface to the third edition, "In the years 1843–56 J. C. Weber gave to the public the fruits of his many years' uninterrupted studies on the Alpine plants. The work no sooner appeared than it created universal admiration: partly on account of the matter being new and attractive—as up to that time a book presenting to the eye, in a series of plates, the most beautifully formed and exquisitely coloured flora belonging to the Alpine region had been wanting—but more especially because each particular illustration is as faithfully coloured as if Nature herself had given the hues."

1st ed. 1843.	300 col. figs.
2nd ed. 1867.	Plates re-arranged after De Candolle's method.
1868.	Supplement of 100 plates of very rare plants.
3rd ed. 1871.	Supplementary plates incorporated.
4th ed. 1878.	French and English names added.

My copy is the 4th edition. Nature certainly did not attend to its colouring, or the Dentarias would not be sky-blue, but I believe the first edition was very beautifully coloured. The purpose of such a book is to enable those who visit the Alps to name the flowers they

find, and this was the forerunner of several works consisting of series of coloured plates, which it will be convenient to deal with next.

M. Graf, the Director of the Botanic Garden at Graz, began a Flora, but, dying before it was completed, M. Petrasch, his successor, carried it on with the help of Prof. Kerner of Vienna, and so "Die Alpenpflanzen nach der Natur gemalt" * was published at Prague 1878–9, containing the beautiful plates painted from living specimens by Joseph Seboth. The book is generally known as Seboth's, owing to the beauty of these plates. An English edition in four vols., edited by Alfred W. Bennett, was published in 1879–80, and is a delightful possession for anyone fond of Alpine plants. It is pleasant to turn over its pages and, by the help of the 400 faithful portraits it contains, remind oneself of favourite flowers when they are out of season, or, as in the case of many, which can only be seen in their full beauty in their mountain homes.

I always linger over t. 95 of vol. iv. and wonder whether any Sempervivum was really so exquisite as the plate the artist has made of *Sempervivum dolomiticum*. Certainly nothing I have as yet grown under that name can compare favourably with it.

Another and somewhat similar work is "Atlas der Alpenflora," published by the German and Austrian Alpine Society, 1882–4, at Vienna, in five small 8vo. volumes, one of text, and four containing between them 500 plates which are almost as charming as those by Seboth. These are by Anton Hartingen, while the text is by Dr. K. W. von Dalla Torre. The plates have a stone-coloured background that gives rather a heavy tone to the green of the leaves. Seboth also used coloured backgrounds in some cases, but with better effect on the whole. One plate of Hartingen's I never tire of. It is No. 405, *Primula Clusiana*, perhaps a trifle glorified, but so lovely that the sight of it has often made me long to rush off to its home beyond Vienna while it is in flower to see if I can find this glorious form. A French edition * was published at Geneva and Basle in 1899, with a volume of text by M. Correvon. Most of the plates in this edition differ from those of the earlier in being prepared from photographs taken from the plants themselves. In some cases this makes them very interesting as showing minute structures, such as the downiness of the carpels in *Paeonia peregrina* in t. 28, and the hairs on leaves and pods of *Draba Sauteri* in t. 165, but as a rule the colouring is bad and heavy, and not so good as in the older edition.

These two last are rather expensive works, costing about a pound a volume, but the second edition of the Atlas only £3 5*s*. A cheaper work, at twelve shillings and sixpence, is Bennett's "Flora of the Alps" (1896) in two volumes, with 120 coloured plates. These are not to be compared with those of the other two books, but its value lies in the text. Its scope is larger than that of earlier works, embracing the Alpine flora of Switzerland and the adjacent mountain districts of France, Italy, Austria, and the Pyrenees. A great number of plants are mentioned; in fact, the author claims that every flowering

plant which is reported by competent authorities as growing wild in Switzerland is at least named and a short description given of all except the commonest English plants. These descriptions are certainly very short, but the main character alone is given and the plants are grouped by common characters, so that the book is a useful guide to ordinary tourists and gardeners.

Thus on p. 24 we find: "*Alyssum* L.—Stem leafy; leaves entire; flowers small, white or yellow; sepals equal or bifid; filaments toothed or winged; seed-vessel cylindrical, few-seeded.

" *A. alpestre* L., with small pale yellow petals, scarcely longer than the sepals, and woody stem; Nicolaithal, Pyrenees, Dauphiny, rare. *A. Wulfenianum* Bernh., with golden-yellow flowers and sharp teeth on the filaments; Switzerland, Tirol, Styria, Carinthia, rare. *A. Rochelii* Andrz., with golden-yellow flowers and blunt filament-teeth; Carinthia, Pyrenees. *A. montanum* L., a shrubby plant with larger yellow flowers; and *A. Perusianum* Gay, *A. spinosum* L., and *A. pyrenaicum* L., with white flowers, the last two spiny; Pyrenees. *A. calycinum* L., flowers yellow, is a weed in cultivated land. *A. incanum* L., flowers white, plant grey with stellate hairs; roadsides, southern Switzerland, rare."

A cheap handbook popular with tourists is Schröter's coloured " Vade-mecum to the Alpine Flora," * a flat, easily carried book, in French, English, and German, with badly drawn and garish illustrations, showing six to ten different plants on a page. The seventh edition appeared in 1900.

Somewhat like it, but with much better illustrations, is Penzig's "Flora delle Alpi" (Milan, 1902), in Italian (lire 7.25). The plates are by Hermann Friese, and are also used in Hoffmann's "Alpine Flora for Tourists,"* of which there is an English translation by Mrs. A. Gepp. (1903, 7*s*. 6*d*.)

There is a very useful series of pocket Floras published by Paul Klincksieck (Librairie des Sciences Naturelles, 3 Rue Corneille, Paris, 6 fr. 50 each). The first of these was H. Correvon's "Flore coloriée de poche à l'usage des Touristes dans les Montagnes de la Suisse, de la Savoie, du Dauphiné, des Pyrénées, &c.," with 144 coloured plates. These are rather weak and washy in colour, but sufficiently well drawn to serve for the identification of the plants. Three later volumes by Ch. Flahault appeared as Series I., II., and III. of "Nouvelle Flore de poche des Alpes et des Pyrénées "* in 1906, 1908, and 1912. In these the plates are better coloured, and there are many useful outline drawings in the text, borrowed from Coste's " Flore de la France." I have found these books very useful and highly recommend them.

A still more pocketable volume is "The Tourist's Guide to the Flora of the Alps," by Prof. Dalla Torre, translated by Alfred Bennett, 1886, which is very reliable and useful considering its size, but containing no illustrations, so we will pass on to Correvon's "Flore Alpine,"* the French and first edition of which appeared in 1908, and an English

translation in 1912,* priced 16*s*. It contains 100 wonderfully artistic and well-drawn plates, but to my mind most of them have a flatness, a lack of perspective and shading, that makes one think of them as better suited for the foundations of designs for tiles or wall-papers than as portraits of living plants. All the same I greatly admire many of them, pl. xvi. for one, on which the varying shapes and hues of *Viola calcarata* are delightfully shown. But on the next page *Viola biflora*, *V. heterophylla*, and *V. cenisia* are no more than flat designs, and so washy in colouring that they give but little idea of the beauty of the real plants. In the text there is a very interesting account of the rise of rock-gardening, and short descriptive notes on some of the most famous rock-gardens, followed by short descriptions of the plants figured and of a few other species of the principal genera.

The companion volume, "Fleurs des Champs et des Bois, des Haies et des Murs" * (1911), far surpasses it in the beauty of its illustrations, each of which is a really beautiful picture as well as a life-like representation of the plant. The artist, Mlle. Sophie Rivier, has carefully observed and reproduced the details of botanical characters, and yet has made a charmingly artistic picture of even so small a weed as *Lamium purpureum* in pl. 8. Shining leaves and berries are most wonderfully represented, as may be seen in *Tamus communis* (pl. 96). *Clematis Vitalba* (pl. 52), in its own quiet way, is another admirable picture. The daring and originality of some of the backgrounds are remarkable, as shown by the rich effect of the flaming orange of a half-suggested cornfield behind the blue heads of the Chicory in pl. 59, and of the autumn tints of fallen Beech leaves behind the crimson and scarlet berries of *Euonymus europaeus* in pl. 98.

H. Stuart Thompson's "Alpine Plants of Europe" * (1911) differs from the foregoing books in that it gives us a much more seriously botanical and valuable text, excellent for the number of species described and the descriptions of their habitats and localities. The 64 coloured plates, giving 311 figures, are Seboth's drawings much reduced in size, and none too well reproduced. They lose terribly by being arranged four or more on a page, and those that have a halo of pale brown background are not pleasing, making the pages look as though they had become badly foxed. His book "Sub-Alpine Plants"* has the advantage of 33 charming coloured plates by George Flemwell, delicate in colouring and well reproduced. These, combined with a text as full and accurate as that of the earlier volume, make it a valuable book, though only priced at 7*s*. 6*d*. It was published in 1912.

Not of much importance, but worth mentioning to make the list as complete as possible, are three other books with coloured figures. "Familiar Swiss Flowers,"* by F. E. Hulme (1908), written in a popular style, has a hundred rather pretty coloured plates, figuring, as the title requires, the better known, and therefore perhaps less interesting, Swiss plants, Soapwort, Tuberous Comfrey, *Geranium sanguineum*, Corn Cockle, *Cardamine pratensis* and such, as well as *Gentiana*

bavarica and *Anemone alpina*. "My Hundred Swiss Flowers," by Mary Pratten (1887), contains rather rough outline drawings, in some of which the flowers look skimpy and sadly asymmetrical. It is issued in two forms, one plain, the other coloured by hand, but not greatly improved thereby. And lastly, "Flowers from the Upper Alps, with Glimpses of their Homes,"* by Elijah Walton (1869): twelve very beautifully reproduced chromolithographs of Walton's drawings. Their chief charm lies in the beautiful backgrounds of mountain and cloud, which were the artist's forte. The flowers look too much as though they were drawn from a gathered specimen propped up in a glass, especially so in the case of *Sempervivum arachnoideum*, of which two flowering stems unite at the base and spring direct from the rock without any accompanying barren rosettes. To each plate there is a page of text by T. G. Bonney.

Photography has made it possible to depict not only the whole colouring of a plant, but also its natural surroundings, and many books now show us Alpine plants at home.

"Alpine Flowers and Rock-Gardens," * by Walter P. Wright (1910, 12*s.* 6*d.*), is one of these, and is illustrated by many of the beautiful coloured postcards published by Nenke and Ostermaier, of Dresden. They look very well mounted on brown paper of two shades. Some of them are rather over-coloured, especially those representing pink and red flowers, and some savour of a little faking in the way of a few additional roots having been transplanted to enrich the group, but on the whole they are very beautiful and instructive, and the vivid blue of Gentians is most faithfully reproduced.

The text is pleasantly and popularly written, and many of the chapters are devoted to cultural points and the construction of rock-gardens. Mr. Graveson contributes a charming account of Alpines in their homes, both in the Alps and in Britain. The latter part of the book gives lists of plants suitable for rock-gardens, and as Narcissi and Irises are included the choice is a wide one.

In "Summer Flowers of the High Alps,"* by Somerville Hastings (1910, 7*s.* 6*d.*), a short introduction goes over much of the ground covered by other books I have mentioned, but the main portion of the book has a new feature best explained by a quotation from the preface :—

"The coloured plates of Alpine plants, which are the special feature of this book, are all reproduced from colour photographs taken directly from Nature. The plants were all photographed exactly as they were found, with two exceptions, in the immediate neighbourhood of Rosenlaui, in the Bernese Oberland, during the month of July 1909; so that the pictures are true portraits of the flowers 'at home.'"

They were taken by the Lumière process and then reproduced by the three-colour process.

The colouring is a trifle soft and dreamy when the green shades are not preponderant and virulent, but all the same the 39 plates

are very pleasing and give a really good idea of the habits of the plants.

Another book showing Alpine plants at home is E. Newell Arber's "Plant Life in Alpine Switzerland"* (1910, 7*s*. 6*d*.). The title-page sets forth that it is "An Account in simple language of the Natural History of Alpine Plants," and the preface tells that the work is not intended to give any aid towards ascertaining the names of Alpines. It is full of interesting facts about plants, very simply and pleasantly related, and is worth reading by everyone who grows, or travels to see, an Alpine plant.

To quote a passage or two :—"The flowers of *Veratrum* are interesting from the fact that, while those of the main flowering shoot usually contain both sexes (hermaphrodite), the flowers of the lateral branches are generally male only." "The flowers of the Round-leaved Saxifrage are interesting from the manner in which the stamens shed their pollen one by one, a peculiarity which is, however, shared by many other plants, including the Grass of Parnassus" (p. 80). "The leaves of *Loiseleuria procumbens*, the Trailing Azalea, are worth examining. It will be found that they are rolled inwards at the edges. The stomata or pores are situated on the lower surface in two grooves near the edges, which are filled with hairs and further protected by the incurving of the leaf at the margins."

The illustrations, whether outline drawings of the organs of plants or photographs of the whole plant in its natural surroundings, are excellent for showing the points of interest. Plate xii., Soldanella spearing through the melting snow, and pl. xxiii. of *Sempervivum montanum* spreading from one crevice to another by means of runners, are of special interest.

Two books by G. Flemwell show us better than any others the effect of the landscape jewelled with Alpine flowers. In "Alpine Flowers and Gardens"* (1910, 7*s*. 6*d*.) we have a pleasant, chatty book, with nothing very new or striking about the plants, but the illustrations are gems. Each is a highly finished picture, with beautiful background of mountain and cloud and a foreground of flowery slopes. In some cases one is rather suspicious of these two having been arranged in juxtaposition in the studio from two separate studies, but even so they are good to look at. The Gardens, by the way, are those Botanic ones lately established in different places in the Alps: the Thomasia near Bex, the Rambertia on the summit of the Rochers de Naye, and the Linnaea, the oldest of them, founded by M. Correvon in 1889. Two chapters are devoted to them, and are very instructive.

"The Flower-Fields of Alpine Switzerland," his book of 1911, pleases me even more. The landscapes are exquisite, and the masses of colour in the foregrounds so true to Nature as to recall many a living scene. In the latter portion of the book are some especially delightful groups of flowers as they grow in the meadows, showing the blossoms of nearly the natural size.

In Gowan's Nature Series there are two charming little volumes,

costing 6*d.* each: "Alpine Plants at Home," Series I. and II.* Each contains sixty photographs by Somerville Hastings of Alpines taken in their natural surroundings.

Then we have books that record Alpine wanderings in search of plants, with personal reminiscences of travel and adventure, scenery and history, more or less mingled with plant lore. Only those in which the plants are paramount need be noticed here.

"Among the Hills," * by Reginald Farrer (1911, 10*s.* 6*d.*), is one of these, a breezy book, and, as the author describes it on the title-page, "A Book of Joy in High Places." Its joy is so infectious that to read it makes one long for, and has, I know, helped many to achieve, visits to the scenes it describes; and after those visits to re-read the book brings more joy of memories and of further plans. I expect it is too well known to need quoting, but I cannot pass by the illustrations, especially the landscapes by Mr. Soper, without a word of especial praise. They all depict the neighbourhood of Mont Cenis, and I feel an extra interest in them because I was entrusted by Mr. Farrer to meet Mr. Soper there and point out to him certain views that had charmed us. Thus many of them were painted while I was happily hunting and digging plants alongside the artist. I think that opposite p. 206, of the meadows just above pleasant little Lanslebourg, gives as true an idea of an Alpine meadow at its best as one could wish for, and I never tire of looking at the beautiful reproduction, or the clever copy of the original sketch Mr. Soper kindly gave me, of his marvellous view of the Dent d'Ambin. Often as I have visited that spot, and crossed the plain, whitened with sheets of *Ranunculus pyrenaeus,* in a hurry to reach the rocks beyond and the rare plants growing on them, I have always lingered at the point from which the sketch was made to enjoy the view of the Dent, so curiously like a Gothic cathedral in its outline; nave, apse, tower, and Lady Chapel all being represented, and generally, when I have been there, all pure snow. It is a pity that, when Mr. Soper drew it, a winter of little snow combined with an early melting, had robbed this cathedral for aviators or angels and the pyramid mountain beyond of their speckless purity. The flowery foreground, sparkling with flowers as brightly as Streeter's shop-window with jewels, is not one atom exaggerated. *Viola calcarata, Gentiana verna* and *G. acaulis*, Crocus, and Douglasia grow there as thickly intermingled as he has painted them, and the orange, scarlet, and crimson of the young leaves of *Rumex alpinus* on the dead brown grass, lately left bare by freshly melted snow, rival any stove-petted Codiaeum or Caladium in their colour. Then again the rosy mass of *Primula farinosa* in the marshes skirting the great road before it takes its plunge down towards Susa is a faithful record of the effect, as I have seen it in three Junes.

Mr. Malby's magic-working camera replaces Mr. Soper's paint-brush in his book "With Camera and Rucksack in the Oberland and Valais,"* and pleasant accounts of many scrambles after rare plants

are beautifully illustrated with his photographs, many of which are reproduced with great skill from those beautifully finished paintings that he is such a master in making out of a photographic print. *Primula hirsuta* in its rocky crevice, *Androsace glacialis*, and *Eritrichium nanum* are three of the best coloured portraits of Alpine plants I know of.

We must now turn to the books that treat of gardens in which to cultivate the plants from mountain-sides, and still one of the most useful is W. Robinson's "Alpine Flowers for Gardens," * as its title now runs in its third edition revised, 1903. It appeared as "Alpine Flowers for *English* Gardens" in 1870, but now appeals to a wider circle. It is constructed on somewhat similar lines to "The English Flower-Garden,"* with introductory chapters on the construction and styles of rock-gardens and a second part in which the plants are arranged in alphabetical order, and here and there charming little pictures are let into the text.

W. Sutherland's "Handbook of Hardy Herbaceous and Alpine Flowers"* (1871) contains a great deal of information, generally very practical and useful, gathered, as stated in the preface, by the writer when manager of the herbaceous department at Kew, but of course its date precludes the mention of many now much-prized Alpines.

"Alpine Plants: a Practical Method for Growing the rarer and more difficult Alpine Flowers,"* by W. A. Clark (1901, and second ed. 1907, 2*s.* 6*d.*), is a small book, but a very useful one, full of good hints for making fretful plants happy, as practised by the writer in Messrs. Backhouse's Nurseries at York.

The instructions for mixing soils, choosing sites, and so on, are as full and precise as a cookery recipe, but just what one wants in the case of a new and untried plant, for instance for *Andromeda fastigiata* on p. 11.

"*Andromeda fastigiata* is no doubt rather difficult to grow unless in the right position and soil. Use a compost of leaf-mould, white sand, and peat (equal proportions). Make the place 18 in. deep, with good drainage, in a partially shady spot; mix the compost well together before planting; make the plants perfectly firm and, after the plant is in its home, cover the surface with fine white sand, and give a good watering, so as to settle the sand well among the shoots. Great care must be taken to top-dress twice a year—spring and autumn—with sand, leaf-mould, and a little fine peat. Spread out the young growths over the surface, and peg them down; then add the above compost, cover the young growths to within two or three inches of their tips, and when this is done give a good watering as before, and the young roots will soon make headway among the freshly added soil, and make provision for the following season's blooms."

One must translate some of its directions for the climate of York into terms of one's own rainfall and average temperature if living in such a place as my dry sun-baked garden, or in favoured Cornwall.

Charles Thonger contributed a volume, "The Book of Rock and Water Gardens,"* to the series of Handbooks of Practical Gardening,

edited by Harry Roberts, published by John Lane, I think in 1906, but my copy is not dated. Six of its chapters are devoted to rock-gardens and plants. Like the rest of the series, it is concise and useful, plentifully illustrated with reproductions of photographs, but, somehow or other, rather dull compared with later books.

Much sound advice and practical knowledge and some instructive and some other pretty photographs are to be found in "Rock-Gardens and How to Make and Maintain them,"* by Lewis B. Meredith (1910, 7*s.* 6*d.*). The preface gives us an idea of its practical value in stating: "Not a single book deals with the subject of the cost, which I have attempted to estimate, basing it on my own practical experience."

The introduction, written by Sir Frederick Moore, states that "Mr. Meredith writes with practical experience. His own rock-garden, constructed by himself, is artistic in conception, covers a considerable area, and suits the requirements of a large and varied collection of all classes of Alpines." This I can endorse, and may add that I never saw better arranged masses of colour in a rock-garden than I did in the author's. Those wishing to form a rock-garden will find some chapters of great service, especially that on the Types of Rock-Garden, with its good illustrations; chapter x., on Propagation; chapter xii., on Planting, with its useful division of rock plants into two classes:—

1. Those which, on account of their freer growth and more generous bloom, can be effectively used for massing.
2. Those grown chiefly on account of their intrinsic beauty, but which, owing to their slower and more diminutive growth, will not, in this country at least, give the same bold dashes of colour.

Here is a bit of good advice: "Never plant rubbish. Do not be persuaded by your friends 'just to fill up your garden with anything to make a show the first year.'

"This is the greatest mistake, for you may afterwards have difficulty in getting rid of what you planted merely as a 'stop-gap.'"

Then follows a word of warning as to planting very strong and rampant-growing plants, and the account of how the introduction of *Convolvulus althaeoides* caused two days' hard work in taking down rockwork, to clear the ground of a plant that travelled four feet underground, working its way behind a rock weighing a quarter of a ton, to appear in the middle of a plant of *Daphne Blagayana*. There is a short chapter on Cost, and Part II. is a useful alphabetical list of plants with their colours and requirements, which, as the preface states, has passed under the critical eye of Mr. Irving.

"The Rock Garden,"* by Reginald Farrer, in "The Present-Day Gardening Series," 1912 (1*s.* 6*d.*), is professedly, to quote the words of its author, written "for the man who has small means and only a small plot of ground to play with," and to teach him "that nothing could possibly fill his small garden plot with perennial delight so

adequately, cheaply, and appropriately as a constellation of rock plants." But as Mr. Farrer has lavished his rich store of picturesque adjectives on a vast number of plants, the reader can scarcely fail to develop a longing to grow them all, so that even those with large collections already will be stirred up by this glowing little book to add to those collections. The Saxifrage, Campanula, Primula, and Dianthus chapters are each a pocket monograph of those families. I have heard the illustrations highly praised, and some are certainly wonderfully good for so cheap a book. But others have a nasty, aniline, bright yet thin colouring that I dislike. It reminds me of a water ice, a tinny-flavoured substitute for the real thing.

A book by a good cultivator and full of useful hints is "Rock and Alpine Gardening,"* by H. Hemsley (1908, 8*s*. 6*d*.), but the shiny paper and brownish tint of the illustrations are not very pleasing.

The last few years have brought a rush of books, and among them, in 1911, "Rock-Gardens and Alpine Plants,"* by E. H. Jenkins (2*s*. 6*d*.), a concise and well-illustrated little book dealing with the whole subject, written by a man with a deep love of, and a long familiarity with, the best Alpines. The classified lists of plants at the end, and the chapters on Alpines in frames, and the Alpine house, should prove of great use.

A new and enlarged edition of this work has been published recently (1915) as ' Rock-Gardens and Alpine Plants,"* by T. W. Sanders (n.d., 3*s*. 6*d*.). It contains all the original work of three sections on Rock-Gardens by E. H. Jenkins, with an additional fourth section, the chapter in which on Moraines is by S. Arnott, and the remaining three chapters apparently by T. W. Sanders. Five coloured plates and a large number of black-and-white illustrations have been added, which, together with the use of wood-pulp instead of glazed paper, have caused the book to appear as a comparatively bulky quarto. A beautiful illustration of a fine clump of *Cyclamen repandum*, facing p. 164, is unfortunately described as *C. neapolitanum*, but taken as a whole the 103 illustrations are good and useful, considering the price of the work.

Mr. Jenkins' next work appeared in 1913, "The Small Rock-Garden"* (2*s*. 6*d*.), one of the "Country Life" Series. Its highly glazed paper, smelling like fresh mortar, offends both my eye and nose, but by its aid the illustrations are very well produced. They are numerous and interesting, and almost every aspect of rock-gardening is dealt with, and so it would prove useful to the maker and owner of a large rock-garden in spite of its title.

A new feature is the chapter on Rockwork as edgings to flower borders, a means of growing Alpine plants in flat and formal gardens too little used. It is illustrated by a capital photograph of the recently constructed rockwork edgings in the kitchen garden at Aldenham House, the most successful example of this style of rockwork I have ever seen. The chapter on the Town and Suburban Rock-Garden should be useful to anyone who contemplates building one in such localities.

D. Wooster's "Alpine Plants."* A first edition in 1871 in one volume, afterwards called the first series, and a second edition, 1874, in two volumes 4to. The preface tells us the work was written to encourage the efforts made by other authors to restore to favour the beautiful little plants, mostly natives of high latitudes, treated with neglect owing to the popular taste for bedding-out.

It is illustrated with 108 plates, many containing two figures. They are for the most part rather gaudy, as chromolithographs of that date were wont to be; but some, such as *Aquilegia alpina*, 46, vol. i., and *Colchicum autumnale fl. pl.*, 18, are pleasing enough. Such plants as *Funkia undulata*, *Erigeron speciosus*, and *Anemone stellata* being included, the work is not strictly confined to true Alpines.

Verlot's "Les Plantes Alpines"* (Paris, 1873) is a French edition of the plates of the first volume re-arranged as to order, and with fresh and much shorter text. Its value lies in some very interesting accounts of expeditions in search of plants to Monte Viso, Mont Cenis, Mont Blanc, Gavarnie, Le Lautaret and other centres, with full lists and localities of the plants met with.

"Rock Gardening for Amateurs,"* by H. H. Thomas and S. Arnott (1914, 6s.), goes over the whole ground on the lightest of wood-pulp paper. Most of the colour photographs are charming in colour and beautifully reproduced. The Ramondia is a trifle blue and too much like the colour of *Meconopsis Wallichii*, but *Lithospermum prostratum* and *Veronica rupestris* are as good as can be wished, and the book is rich in good half-tone plates. The descriptive lists of plants at the end are arranged according to families, and usefully divided in many cases into the easily grown and more difficult species, and a great number of plants are included.

M. Correvon published a small book in 1914, "Plantes des Montagnes et des Rochers: leur acclimatation et leur culture dans les Jardins."* It contains very full lists of plants, mostly described by means of symbols and abbreviations, so that it is a very handy and concise book of reference. There is a chapter on noted rock-gardens in England and on the Continent, and also the Botanic Alpine Gardens in the Alps themselves, and an especially interesting chapter headed *Cultures spéciales*, in which the growing of Alpine plants in pure Sphagnum is described and advocated for hot sunny climates such as that of Geneva.

"Les Jardins Alpins," by Ivolas, Paris and Geneva, 1908, I have not seen.

There are many useful hints in Miss Jekyll's "Wall and Water Gardens"* for the use of stone in supporting walls and dry walls, and for grouping Alpines on them.

In "My Garden," by Eden Phillpotts, chapters v.–viii. deal with the author's rock-garden in a delightfully humorous vein, and this brings us to the books about individual rock-gardens written by their owners.

The earliest of these is "My Rock-Garden,"* by Reginald Farrer

(1907), the first of this many-sided author's gardening books, and I suppose as well known as any book on the subject.

All we need do here, then, is to note the effect it has produced. It inaugurated a new way of writing and thinking about Alpine plants, a more personal and critical view, which was especially responded to by amateurs already a little way along the road of good rock-gardening—those past the "fill it up with *Lithospermum prostratum*, *Aubrietia*, and Mossy Saxifrages" stage, but not beyond feeling one patch of *Saxifraga Aizoon*, a rosette of *longifolia*, and some colonies of *Cotyledon* a noble tribute to the family.

For such the chapters on Saxifrages, for instance, were revelations. A mixture of practical knowledge of the plants, both in their native mountains and under cultivation, with whimsical ideas, illustrated with quotations and references resulting from wide reading and a remarkable memory, go to make up a conversational style of writing that amuses the reader as well as instructing him. Wild and weird adjectives gathered from Edward Lear, friends with Malapropian tendencies or even at times coined on the spot by the writer, lead him on till thus beguiled he finds himself keenly interested, and, what is more, likely to remember that "true *Gentiana gelida* is a dingy cluster-headed Caucasian and the true *algida* a Siberian species rather like a spoiled and bloated *Pneumonanthe*, whose colour has run."

Another influence the book has had is to induce people to pronounce aright certain specifics in constant use. To quote from the preface, this has been accomplished thus :—

"As for spelling, some may be shocked by 'Himālya' and 'Aeizoeides'; my only aim in this was to help the proper pronunciation, it being quite as easy to say Aeizoeides, which is right, as Aizoydes or Aïzōides, which are both wrong." The constant occurrence of the unusual spelling of these words is offensive to the eye, but their blessed influence has been very comforting to the ear.

Those who have read and liked and learnt from this volume will read and enjoy the same author's "Alpine and Bog Plants"* (1908) and "In a Yorkshire Garden"* (1909). This last is the book which is mainly responsible for the so-called moraine garden of the present day, the small bed surrounded by stone filled with road-mending material of many gardens, which has prolonged the life, or dying-agonies, of many a difficult Alpine.

Even Mr. Farrer, I think, would admit that these primitive moraines are not all he claims for them in climates unlike that of Ingleborough. His claims that one can of water was all-sufficient to keep them cool and moist below in a period of drought, and that they were free from weeds, have not been everywhere justified. For underground pipes are now favoured adjuncts, and everything in the garden that has never yet germinated a seed, as well as all the weeds of the neighbourhood, fill my moraines with a few treasures and material for haycocks of rubbish. Yet the moraine *is* a joy, and we have this book to thank for many successful ones.

"That Rock-Garden of Ours,"* by F. E. Hulme (1909, 10*s*. 6*d*.), is a thick, *rather* prettily illustrated volume, chiefly dealing with many British plants and the commoner sub-Alpines, and giving many bits of plant lore and other matter not very closely connected with what we expect now in a book devoted to rock-gardening. It is a discursive, instructive, genial book for one who likes to read Parkinson's and Gerard's remarks at second hand.

"The Story of my Rock-Garden,"* by A. Reginald Malby (1912), would be well worth the modest half-crown the volume costs for the lovely coloured photographs and half-tone illustrations alone. It also gives very useful hints for the cultivation of Alpines, on a small scale, and anyone, however long he may have been building and tending rock-gardens, can learn much from this book.

Another class of books needed by the serious student of Alpine plants includes several good floras, some for the whole of Europe, others of countries containing high mountains, or of mountainous districts only.

Woods' "Tourist's Flora," published in 1850 and costing now about 30*s*., gives a great deal of information. Its aim is to aid the lover of botany in determining the names of any wild plants he may meet with when journeying in the British Islands, France, Germany, Switzerland, and Italy. The descriptions are necessarily much condensed, but good keys are given to many genera, so that it is easy to hunt down a plant. The localities and nature of habitats are very full and useful, but the names are rather out of date compared with more modern floras.

Nyman's "Conspectus Florae Europaeae,"* 1878–1882, with the Additamenta of 1886 and two Supplements in 1883–4 and 1889–90 respectively, is a scarce and precious work, fetching £6 or more. It is really a list of European plants with their authors and localities, and also gives reference to exsiccata, a feature which forms a specially valuable portion of the work. Only occasionally is there any description, and then chiefly such as "*a praeced. parum diversa*," or in stating wherein a named form differs from the type, or if considered a hybrid. All its information, however, is so reliable that it is still the book of reference on the distribution of European plants, and hence its high price.

Koch's "Synopsis der Deutschen und Schweizer Flora," 1890, in continuation, is a somewhat similar work for a smaller district, with very full lists of localities and much information, but in German.

Gremli's "Swiss Flora," translated by Leonard W. Paitson from the fifth edition, 1889, is invaluable as a pocket text-book for the Swiss Alps. The plan of its keys is good, and a little practice should enable anyone, with Gremli's aid, to name every plant found in Switzerland.

There is a good French edition of Schinz and Keller's "Flore de la Suisse," revised by Wilczek and Schinz, Lausanne, 1909. There does not seem much to choose between this and Gremli for working

out the identity of a plant, but this work is arranged on Engler's system, and the Hieraciums are very fully dealt with.

Bonnier and Layens published a book in French in 1907 (?), "Flore Complète de la France et de la Suisse," with 5,388 figures. It is in the form of a key to find out the name of any plant, and good and useful, but not "complete," for *Crocus medius* of the Maritime Alps is omitted. The illustrations are wonderfully good, generally giving only the critical characters of the species, but of course are very minute and a sore trial to elderly eyes.

There is also a new work by Gaston Bonnier, "Flore Complète, illustrée en couleurs, de France, Suisse et Belgique" (two volumes published at present).

The Abbé Coste's wonderful "Flore de la France,"* in 3 volumes 8vo. Paris, 1901–3, includes many Alpines, and the keys for genera and species are very good and useful in working out difficult plants. The little outline drawings of each species are especially good, and the critical characters of each are shown enlarged by the side of the spray of the flowering plant.

For smaller districts there are Bouvier's "Flore des Alpes de la Suisse et la Savoie," 1878; Ardoino's "Flore des Alpes Maritimes," 1867, and 2nd edition, 1879.

A larger and more important work is "Flore des Alpes Maritimes," (4 vols. by E. Burnat and vol. 5 by F. Cavillier, 1892–1915, in continuation), of which five volumes have been so far published. This is a very thorough and carefully prepared flora of the district, and can be purchased for something over two pounds.

Space does not permit the inclusion of monographs of genera or families containing Alpine plants, so the last books I will notice this time are one that comes to us from Japan and another from France.

"Pocket Atlas of Alpine Plants of Japan,"* by Prof. M. Miyoshi, Tokyo (vol. i. 1906; vol. ii. 1907; 18s.). These two volumes contain coloured figures of 408 plants. Though small, these figures are excellent and represent an exceedingly interesting set of Alpine plants. The text is in Japanese and English, and consists of very brief descriptions of the habitat, time of flowering, and the chief features of the plants figured. Thus: "220. *Primula cuneifolia* Ledeb. var. *heterodonta* Makino, Northern Japan, grass-region (Mt. Iwaki, Mutsu). Fl. June. Perennial; leaves irregularly dentate on margin." So that a great deal of useful information is condensed into a small space.

'Icones Florae Alpinae Plantarum' was commenced in 1911 by M. Léon Marret and five fascicules appeared before the end of that year. After an interval three more fascicules have appeared, each of which is much larger than any of the first five. In the preparation of the later numbers M. Marret has had the benefit of the collaboration of many distinguished botanists, and Mr. Farrer has contributed a preface in English and cultural notes to the second series.

This is a critical and valuable work on Alpine plants. The maps showing the distribution of each plant dealt with are excellent, and the plates are photographs of herbarium specimens of the plants themselves, and singularly complete and instructive on account of the numbers of specimens from different localities that they contain. The anatomical details given in the last three fascicules are beautifully drawn and most helpful. The work is still in continuation.

THE DAHLIA.

By J. B. RIDING, F.R.H.S.

[Read September 14, 1915; Dr. F. Keeble, F.R.S., in the Chair.]

THE Dahlia is undoubtedly the brightest flower we have during the autumn months in our gardens; in fact, few flowers can vie with it for brilliancy of colouring, and certainly no other can be cultivated more easily. Yet in spite of this the Dahlia is not the popular flower to-day that its merits deserve. I feel I am quite safe in saying that the modern dahlia is practically unknown to the general public. It rarely receives any attention in large private gardens, and it is still somewhat neglected in our public parks and gardens. True, in the latter places there is evidence that the plant is becoming more appreciated, and I venture to state that it will be more largely employed in the near future.

The Dahlia has suffered ever since it was first introduced into the country by falling into the hands of florists and exhibitors, and I feel sure in my own mind this has been the reason why the Dahlia has never risen, or at all events to any extent, in the estimation of garden-lovers. Even to-day there are hundreds of garden-owners who shrug their shoulders at the very mention of Dahlias. Why? Simply because their knowledge does not extend beyond the flower show, and they have no idea of the many beautiful forms that are rarely, if ever, seen at a Dahlia exhibition, while others, and their names must be legion, have purchased their Dahlias at exhibitions where they have been displayed in wire frames; the following season they have been planted in the garden, and beyond a mass of greenery they produced no further effect.

I have said that the Dahlia has suffered considerably in consequence of the florist's art. You will remember, no doubt, in the first case our old florists paid the utmost attention to doubling the flower, but, not satisfied with this, they commenced, and soon succeeded in, producing large double flowers, almost as round as a cricket ball, and just as formal. These handsome flowers were much too stiff and formal for modern taste, so that their cultivation really never passed beyond the pale of the florist and exhibitor. With the advent of *Dahlia Juarezii* with its freer form, which conformed more with the taste of the age, the Dahlia appeared to be saved from oblivion. Here again our florists and exhibitors stepped in and commenced to improve the type according to their ideas, but they paid no attention whatever to the habit of the plant. It must, however, be admitted that our raisers have evolved some wonderful

colours and forms in the Cactus section : in fact, so much so that the modern exhibition Cactus Dahlia bears little resemblance to its original form. To obtain this, however, they lost sight of every other section of the community, save the exhibitor. It will thus be seen that up to a certain point they failed to note that exhibitors form the smallest section of the Dahlia-growing community, and while they were producing splendid flowers they were altogether neglecting the Dahlia as a garden plant. If any plant could say " Save me from my friends," then surely that plant is the Dahlia.

During the past decade or so, however, new types have been produced, which, while they do not perhaps appeal so much to the exhibitor, who is generally very loth to change his ideas, certainly do appeal to the flower-loving public, and there is abundant evidence that the Dahlia is likely to become more popular in the future as a decorative garden plant. I should also add, in fairness to the raisers, that they are endeavouring to produce their new varieties with strong erect stems ; this is, of course, a matter of time, but I feel certain that soon we shall see the end of varieties with pendent stems.

I now wish to explain the various types of the flower.

The Show Dahlia includes all doubles with self-coloured flowers, all shaded flowers, and all those having a light ground colour, with a deeper shading or tipping at the edges.

A Fancy Dahlia may be tipped or striped or both. In a tipped flower each floret should have a clearly defined tip of a lighter shade. A striped flower should have the markings a deeper shade than the ground colour.

Pompon Dahlias are simply miniature forms of the Show Dahlia, and are too well known to require description.

The Single Dahlia describes itself, but not, however, from an exhibitor's point of view ; in the latter case the flowers must be quite round in outline, with the florets overlapping.

Now, having disposed of all the older types of the flower, we come to the Cactus section. I am pleased to say here that a standard of perfection has never been drawn up, for their diversity of form could not be judged by a single standard.

The Peony-flowered Dahlia is a much more modern introduction, and its advent gave rise to much adverse criticism ; however, it has outlived such attacks, and is now one of the most popular divisions of decorative garden Dahlias. The same remarks apply with equal force to the Collerette section, which have now firmly planted themselves in our gardens. The Anemone-flowered Dahlia is still in its infancy, but there is abundant material for raisers to work upon and so add another beautiful section of the Dahlia to our gardens. The Decorative Dahlias include all those nondescript varieties that cannot be placed under any of the recognized forms, and many of our most useful garden Dahlias are to be found here. They include the giant flowers ; the dwarf-growing varieties, sometimes called bedding Dahlias ; single varieties, whose form will not allow them to be

classed with the exhibition sorts; and those varieties that are grown chiefly for their foliage effect. Other types must still be added, such as the Parisian Singles, Star Dahlias, and the Cosmea-flowered varieties.

I think I have noted the chief of the various forms in cultivation, at all events quite enough to point out the great diversity of the flower, and I feel certain that the Dahlia will continue to produce other breaks, and that finality is by no means reached.

Objection has often been taken to the Dahlia on the ground that the flowers are not adapted to room decoration, to which I at once take exception. You will note the handsome vases exhibited in our Hall at our Autumn Shows, which were probably cut twenty-four hours previously. Surely they are clear evidence that the Dahlia is a suitable flower for any decorative work. It must be admitted that our high-class florists have made no serious attempt to popularize the flower in this direction. Our friends in the United States of America regard the Dahlia as a first-class decorative subject, and millions of blooms must be grown for this purpose alone. One correspondent writes to me this spring that he is growing seventy-five acres of Dahlias for cut-flower purposes, and, although perhaps he may be the largest grower in the States, there are hundreds of others with smaller acreages, clearly showing that our American friends know how to utilize the Dahlia for decorative work. This is in a large measure due to the varieties utilized for this work, which are largely of the types we know as Decorative Dahlias. They undoubtedly have more lasting properties than the Cactus varieties; and, moreover, where flowers have long railway journeys before reaching their market, the Decorative types pack and travel much better than the Cactus section, simply because the petals are shorter and of greater substance. Possibly the time may come when we in this country may have the audacity to consider the Dahlia as a decorative flower, just in the same way as our American cousins view it to-day.

I might say in passing that the Dahlia is perhaps more popular in foreign climes than in our own, especially at the present time. Briefly speaking, the United States and Canada certainly favour the Decorative type of the flower; Japan undoubtedly favours the Cactus section. Australia as a whole grows the Peony-flowered section for preference. South Africa, I think, is at present growing most sections, but with a decided leaning to the Peony-flowered varieties. Russia must surely grow the Cactus varieties only, if one can form an opinion from their import orders.

One has only to reflect for a moment to form an idea of the vast area of the globe that is now growing the Dahlia for commercial purposes, or purely from an amateur's point of view, the latter being of course in the ascendency.

Details of the cultivation of the Dahlia do not enter into my paper, though I feel I must point out that most of the writers on this particular phase of the subject must have had precisely the same

experience, inasmuch as their information on the threadbare subjects of soils, manures, propagation, general cultivation, positions, and so on, appear so exactly alike that surely the last word has been said on the cultivation of the Dahlia. All the same, the would-be grower to-day finds that he has plenty to learn from actual experience before he becomes proficient in Dahlia-growing, as naturally is the case with all other flowers of which one makes a speciality.

I should like to find out the name of the individual who first put it abroad that the Dahlia was eminently suitable for growing amongst shrubs, or at the edge of a shrubbery, for his name should certainly go down to posterity. It has never yet been my good fortune to see really good Dahlias growing in such surroundings, though I have seen thousands of Dahlias endeavouring to exist under such adverse conditions. One has only to reflect for a moment to recall the fact that a Dahlia plant has to make its main growth between the months of June and September to realize the impossibility of such a feat under these adverse conditions.

The Dahlia requires air and sun to develop its greatest capabilities, and it is only under these conditions that we see it in its best form. The plants should be staked out so that the growth may be properly matured, and no Dahlia bundled up like a faggot can produce satisfactory results. On the other hand, I cannot appreciate the huge stakes that appear to be quite a necessary equipment to most Dahlia-growers. Our aim should be to secure the plant from strong winds, and at the same time hide our machinery for accomplishing this purpose.

It is pleasing to note that all sections of the flower are now being cared for, and it is significant that the Floral Committee of the R.H.S. are now recommending awards to Dahlias that a few years ago would have been laughed at because they lack the rigid form required by the florist.

In conclusion I should like to pay a tribute to the splendid Dahlia trials carried out by Mr. R. Cory at Duffryn, Cardiff. It is only under such conditions that a true idea of the value of the Dahlia as a decorative garden plant can be appreciated. The old nursery lines were entirely absent, the plants under trial being grouped under the most natural conditions, with the result that the Dahlia as seen at Duffryn should find a reflection in many other gardens.

NOTES ON A ROCK GARDEN.

By D. SARSONS, Rock-garden Foreman, Wisley.

[Read December 7, 1915; Rev. W. Wilks, M.A., V.M.H., in the Chair.]

SOME people are inclined to marvel at the very great increase in the number of rock gardens which has taken place during the last few years. But the reason for their popularity is not far to seek, for they add a season of interest to the garden when other flowers are scarce. From early in the spring, commencing in January, onward right through the summer, there are always interesting plants in flower, when, in other parts of the garden, flowers are not yet out, or have more or less finished. A garden, therefore, hardly seems complete without a rock garden in these days. With its many interesting alpines tucked away snugly in little pockets ready to burst forth into blossom when the time comes, the rock garden can always display a number of little plants to surprise one by their brilliant flowers or wonderful foliage.

Rock gardens are at their best during April, May, and June, when they should be a blaze of different colours, and if the plants are well arranged they make a very fascinating picture. It should always be remembered that the rock garden is the home of small alpines, and that it should not be planted with other garden flowers such as herbaceous plants or annuals, for these latter grow too rapidly and would soon overgrow and destroy the many little rare plants which mostly love plenty of light and air.

Many people would gladly add a rock garden to their garden if they only knew how easily a small one can be made, and often the rock is lying unused and near at hand, from which, with a little work and thought in arranging the stones, a very attractive rock garden could be formed. The site for a rock garden should not be surrounded or overhung by trees, but open to the warm sunshine, and sheltered if possible from north-east winds, which in early spring are very destructive to the tender young alpine flowers, which open early in the season, such for instance as *Saxifraga Burseriana*, *S. Burseriana major*, *S. Burseriana Gloria*, *S. Boydii*, *S. Boydii alba*, *Iris Histrio*, *I. histrioides*, *I. reticulata*, *I. Danfordiae*, and so on. The rock garden should, if possible, face south or south-west, as these aspects are more suitable for the majority of alpine plants; north and north-east are also useful aspects for some plants, especially if sheltered from cold winds; true northern aspects are suitable for such plants as Ferns, Ramondias, Primulas, and others, which love shade or half shade.

In preparing the ground it is advisable to dig it very deeply, or better still to trench it, and thus both avoid stagnant moisture in the winter, and save the plants from suffering from drought in the summer. Moreover, since some alpines are very deep-rooting, trenched soil offers a further advantage to them. Different varieties of soil require different treatment. If plants are to do well in heavy soil, it will require plenty of drainage. If a rock garden is to be made on the flat it would be quite an easy undertaking if it is possible to get a good quantity of road scrapings, not from tarred roads. If the scrapings are mixed with plenty of leaves and garden soil, a good gritty compost suitable for alpines is obtained. A well-decayed garden refuse heap is also a useful compost for the rock garden, and plants thrive well in it. It is not advisable to add limestone or mortar rubble to the soil, as there are many alpines which are not at home in soil containing lime. Hence it is best to add the limestone or mortar rubble when planting such plants as require lime. It is best to make mounds on the large rather than on the small scale, as by so doing the plants do not suffer from drought as they do on a small mound if not kept well watered during the summer months.

A plan must be drawn, or an idea formed as to paths, water, &c., and straight paths or anything that would cause the rock garden to look formal should be avoided. The charm of the garden lies in the many little surprise corners, and nooks in which the most interesting plants will be found nestling. Moreover, winding paths give many different aspects, which are very necessary for the different plants. They provide shady nooks, and nooks in half shade, as well as others in full sun. This variety of aspect is most important for the successful growing of the many and various rare alpines.

When building a rockery the stone should be placed in as natural a manner as possible. Start from the bottom and build upwards, fixing the stones firmly, so that the gardener may stand on them when weeding. The stones should always be laid the way of the grain and tilting slightly inwards, so that the rain may run back to the roots instead of dripping over and spoiling the plants below. Give prominence to the boldest part of the rock stone; avoid squareness; and use the thinner flat stones for paths, stepping-stones, &c. It is very important to take care to fill up well behind each stone and also under it, as it is laid in position. Make all quite firm, for if this is not done the result will be that after heavy storms either the stone or the soil will sink, and by so doing cause a great deal of mischief. The plants undermined will suffer from drought, and the hollowed-out soil will harbour rats, mice, slugs, and harmful insects.

Having thus built the rockery, we will first plant it with some of the many small shrubs which are suitable. It is much easier to plant alpines to shrubs than to plant shrubs to alpines, and therefore the shrubs should be planted first. There is a large variety of shrubs from which a good choice may be made, and the following are especially suitable for a small rock garden :—the dwarf varieties of *Picea excelsa*,

viz. *pygmaea, procumbens, pumila,* and *conica*; the little Junipers with their beautiful, soft, evergreen foliage—*Juniperus Sabina prostrata* for a sloping bank, *J. Sabina procumbens, J. S. tamariscifolia, J. Hudsoniana,* and *J. communis compressa* (or *J. hibernica,* as it is sometimes called), a beautiful little compact shrub, which takes many years to grow 18 inches high, and worth a place on every rockery. *Genista sagittalis* is a native of South Europe, with stems curiously flattened in the semblance of the wings of an arrow (hence its specific name), and pretty heads of yellow gorse-like flowers. It looks best on a sloping bank, and if cut back early in the spring the plant may be kept to a height of 6 to 9 inches. *Genista tinctoria* and *G. tinctoria plena* form low round bushes with rich green broom-like growth, crowded with spikes of golden-yellow blossom. They grow well on dry banks. *Genista tinctoria humifusa,* a trailing shrubby species, is useful for growing over stones. *Cytisus kewensis,* a pretty hybrid, slightly prostrate, looks well with its pale yellow flowers hanging over the stones, and so also does *C. sericeus. C. purpureus,* from the Alps, with purple flowers, differs from the others of the family in that it sends up from underground the new growth on which it flowers the following season; hence it is necessary each year to cut back some of the old flowering wood to a strong new growth. *Prunus nana,* the dwarf Almond, a native of Southern Russia, bears its lively rose-coloured flowers during March and April. Its leaves are narrow, smooth, dark green, and glossy; a charming shrub, thriving well in a dry position, and if treated in the same way as *Cytisus purpureus* giving a profusion of flowers. *Rhododendron racemosum,* from China, is an evergreen and is charming in early spring, with lovely little rosy flowers. It should be planted in a sheltered nook, as the late frosts often destroy the flowers. It does best in peaty loam. *R. intricatum,* also from China, is a very dwarf and slow-growing evergreen, but bears a profusion of pale bluish-mauve flowers early in the spring, and often flowers a second time in the autumn. Like *R. racemosum,* it is occasionally spoilt by the late frosts. Both of these plants are beautiful shrubs and ought to be on every rockery. *Berberis Wilsonae,* a new species from China, is of dwarf bushy habit, with golden-yellow flowers; the stems, being much branched, form an impenetrable mass and the spines, nearly an inch long, are a splendid protection for the mass of orange-red berries in autumn. By thinning out the old wood after the berries have fallen the beauty of the shrub is enhanced, since the plant then flowers and berries more freely. This plant is seen to best advantage if placed between two corner-stones, so that its branches overhang.

Daphne Cneorum and *D. Cneorum major,* natives of South Europe are of all Daphnes the most worth growing on the rock garden. Planted in good, deep, fibrous, peaty loam, among rock, where the roots may be cool and the branches partly shaded from midday sun, they form low evergreen cushions, bearing on the tips of the branches in May, and sometimes again in September, clusters of pink flowers of exquisite fragrance. No pains should be spared in trying to get these

sometimes difficult little shrubs to flourish. The beautiful prostrate species *D. Blagayana* is an evergreen with creamy-white and very fragrant flowers. It should be planted in a sheltered, half-shaded nook, in a compost of sand, peat, and fibrous loam. To ensure success with these Daphnes, the young growths must be pegged down every year, and the plants top-dressed in August. *D. alpina, D. japonica, D. neapolitana*, and *D. hybrida* are dwarf deciduous shrubs, any of which may be included on the rock garden. *Rhododendron indicum* var. *balsaminaeflorum* (syn. *Azalea rosaeflora*) is a beautiful dwarf plant which does well in sheltered spots in ordinary soil with a little leaf-mould. *Loiseleuria* (*Azalea*) *procumbens*, said to be the smallest shrub grown, grows naturally on the mountain-side and proves a tiresome plant to some growers. It requires a south-east aspect, where it is sheltered from midday sun, either by a tree or a big stone, and should be planted on a well-drained sloping bank in a compost of hard peat, strong fibrous loam, and granite chips, to which a little leaf-mould may be added. The compost should be passed through a sieve, the hard spongy peat being used making it very firm. An annual top-dressing of fine sand and peat is appreciated by this plant. *Polygonum vacciniifolium*, from the Himalayas, is quite hardy and thrives in almost any soil, but it is best seen where its shoots can ramble over stones. Under favourable conditions it grows rapidly, and produces a profusion of rosy flowers in autumn. *Margyricarpus setosus*, a pretty, prostrate, shrubby, heath-like plant, studded with white pearl-like berries, is suitable for a sunny bank. *Veronica* is a large genus, including many dwarf and shrubby species, some trailing or carpeting in their growth. The flowers are generally of a blue shade, but range from rose to a dull white. *V. salicornioides* is a compact little golden shrub, 9 inches high, rather inclined to die off in the centre, a fault which may be prevented by top-dressing in autumn or early spring. *V. pimeleoides, V. Hectori, V. buxifolia*, and *V. pinguifolia* are also suitable for a small rockery. Helianthemums (Sun Roses) are charming little shrubs of low spreading habit, indispensable to the rock garden, and excellent for dry sunny banks. The flowers, somewhat resembling tiny roses, single or double, are produced in extraordinary profusion in June and July. 'Fireball,' 'The Bride,' and 'Mrs. C. W. Earle' are three of the best. They are easily increased by cuttings in the autumn or spring. Cistuses (Rock Roses) are very beautiful shrubs, suitable for very sunny positions, and although they will do in any light garden soil, they are specially suited in a sandy one. They should be sheltered from cold north-easterly winds. The hardiest are *Cistus laurifolius*, with large white flowers and very fragrant foliage, and *C. cyprius*, pure white, each petal with a dark purple-brown blotch, and both with thick, gummy leaves. They may be increased easily by seeds and cuttings. *C. salvifolius* has white flowers, *C. lusitanicus* large white flowers with crimson and gold blotches. The Cistuses are apt to make long straggly growth, but by taking out the leader during the growing season they may be kept more compact.

Euonymus radicans kewensis is a very charming, compact, little trailing shrub; *E. microphyllus*, *E. m. variegatus*, and *E. nanus variegatus* are very small indeed. *Cotoneaster congesta* and *C. adpressa* are most useful when planted behind stones, so that they may ramble over them. *C. horizontalis* is a larger species, and very pretty in the autumn with its brightly-tinted foliage and beautiful red berries. *Salix reticulata*, *S. Myrsinites*, and *S. serpyllifolia*, of procumbent habit, are useful in shady places where other plants will not do well. *Corokia Cotoneaster* is a pretty, dwarf, and curious New Zealand shrub, forming a dense, much-branched mass. Its leaves are small and white on the underside, and the plant bears myriads of minute yellow star-shaped flowers.

Other shrubs suitable for the rock garden are *Ilex crenata*, *Thuya occidentalis Spaethii*, *Hedera Helix* var. *minima*, *Retinospora Sanderi*, and *Cupressus pisifera* var. *plumosa aurea*. *Colletia cruciata* is a curious Chilian shrub of the Buckthorn order. Its stems are armed with stout flattened spines, and its white flowers, though small, are fragrant and very numerous in summer. It requires a sheltered yet sunny position. *Hypericum* (St. John's Wort) is a most useful genus for the rock garden. *H. olympicum*, one of the largest-flowered, is 1 foot high, with glaucous foliage. After flowering the plant should be cut down almost to the ground, to encourage the new growth for the following season. It may be increased by division, cuttings, or seeds. *H. Moserianum* is a handsome hybrid. *H. olympicum gracile* and *H. fragile* are beautiful plants for sunny or half-shady crevices. They cling tightly to the rocks and bear a mass of yellow flowers. *H. reptans* should be planted behind a stone, so that the foliage may grow down over the face where its masses of yellow flowers show to advantage. It does best in half shade and in a sheltered position, and may be increased by seed and cuttings.

Of *Lithospermum* two of the finest are *L. prostratum* and *L. p.* 'Heavenly Blue,' spreading little evergreens, the former with flowers of a lovely blue, with faint reddish-violet stripes, borne in great profusion when the plant is well grown. 'Heavenly Blue,' as its name indicates, is of a lighter colour. They are hardy, and valuable as rock plants by reason of their prostrate habit and fine blue flowers—a blue scarcely surpassed by that of the Gentians. *L. p.* 'Heavenly Blue' grows best on a hot sunny bank in a deep compost of sandy soil with a little peat or leaf-mould; it is easily increased by cuttings taken in August or September. The cuttings, if put into a close frame or greenhouse, take from six weeks to two months to root. When rooted they should be potted singly, kept in frames for the winter, and planted out in the spring. It should be noted that these Lithospermums will not grow in soil which contains lime. *L. prostratum*, I find, is much more difficult to root than 'Heavenly Blue.'

Ceratostigma plumbaginoides syn. *Plumbago Larpentae*, a very desirable Chinese plant, grows 1 foot high and bears bright cobalt-blue flowers in the autumn, at which season the leaves change to a beautiful

red shade. It should be planted in a hot sunny position, in sandy soil, well drained.

Epigaea repens, from North America, is a rare plant in the alpine garden, although there are many places in which it would do well. It should be grown in a shady nook on the north side of a bank, and must be sheltered from the north wind by rocks or shrubs. It does not require sun, but does well in a moderately damp place, in a compost of fibrous peat, fibrous loam, and leaf-mould in equal parts, to which a little sand is added; the compost should be a foot or more deep. Pegging down and top-dressing are necessary, and the plant may be increased by division. It bears clusters of beautiful white fragrant flowers early in the spring.

Soldanella montana, *S. alpina*, and *S. pusilla* are a lovely group, forming dense cushions of round, leathery, deep green foliage. Their slender stems support delicate bell-shaped flowers, beautifully fringed. They are fond of a moist, shady, well-drained place, and grow well in a compost of turfy loam, leaf-mould, peat, and good sharp sand. Top-dress with leaf-mould and sand in equal parts once or twice a year. A sheet of glass over them during the winter is a great protection to the early flower-buds. These plants are most useful for the alpine house, as they do exceedingly well in pans. They are increased by division after flowering, or by seed sown in a frame as soon as it is ripe.

Shortia galacifolia is a very beautiful and rare Californian plant with evergreen leaves, which become crimson in winter. The pretty, fringed, semi-nodding flowers are white on opening and change to pale rose. It should be given a choice position in a damp, well-drained, half-shady place, and grown in a compost of fibrous loam, sand, leaf-mould, and peat. The fine part should be taken out of the loam before mixing with the other compost; the bed should be made firm and about 1 foot deep. Top-dress annually, and increase by division after flowering.

Schizocodon soldanelloides is a very rare Japanese plant of great beauty. It forms tufts of evergreen shiny leaves, and bears fringed, bell-shaped, bright red flowers, dark in the centre and paler at the edges. It does best in a well-drained, half-shady place, in a peaty, turfy, fibrous loam and sand, and may be increased by division.

Ramondia pyrenaica is one of the loveliest of all the Pyrenean plants, especially when seen in masses. It forms rosettes of dark dull-green hairy foliage, from which issue large violet-purple blossoms with orange centres. When well grown, plants bear from six to eight flower-spikes, each spike with from four to seven flowers. They should be planted between rocks, more or less on their sides, so as to throw the rain off their centres. They root deeply, and require a compost of good, deep fibrous loam and peat in equal parts, and a little limestone. They should occupy a well-drained moist place facing north, as they do not like the full sun.

Haberlea rhodopensis is a Grecian plant which delights in a cool, shady position, and does well under similar treatment to that advised for Ramondias. The Streptocarpus-like flowers are borne on longer stems than are those of *Ramondia*.

Linnaea borealis and *L. b. americana* are rare plants in gardens, with pretty leaves, and slender stems bearing pairs of dainty, fragrant, rosy flowers. They do best in a shady place on the side of a bog-garden in peat, loam, and sand, or on the north of the rockery, near a path, where they can have attention. A top dressing of leaf-mould and sand should be given once or twice a year, so that they may root freely. Pegging down should be attended to, in case the wind loosens the shoots. A rather damp bottom suits it well.

Androsaces are typical alpines, of fascinating beauty, but many of them are difficult to grow. Their worst enemies are winter and early spring rains. They require a rich sandy or gritty loam, with a liberal mixture of small lumps of sandstone. Full exposure to the sun suits them well, and though their silky roots find a difficulty in penetrating stiff, sticky soil, they will search deeply into light, gritty loam, on a slope, finding the moisture which they love among the buried stones, and so withstand and enjoy a scorching sun, which in a stiffer soil would kill them outright. A covering of a sheet of glass is of the greatest help to the woolly species in winter. *Androsace arachnoidea*, *A. sarmentosa*, *A. s. Chumbyi*, *A. primuloides*, and *A. sempervivoides* all require similar treatment, and should be planted on a sloping bed, facing full sun, a rock sheltering them from the north-east. They require a little limestone or mortar rubble added to soil. These Androsaces throw out numerous runners like those of a strawberry. These may be pegged down, or cut off and potted, to increase stock. All these Androsaces bear flowers similar to those of *Primula*, varying in colour from deep pink to white, with various-coloured centres. *Androsace lanuginosa*, a Himalayan species, has trailing stems, silky foliage, and bears in September heads of rose-pink, yellow-eyed flowers. It should be planted so that it hangs over a stone in a well-drained, sunny position. The compost should be of gritty loam and peat, with a little limestone. The plant should be cut back in the spring, and is easily increased by cuttings made in September. *A. lanuginosa Leichtlinii* is similar to the last named, and requires similar treatment; but it flowers more freely, and has white flowers with carmine eyes. *A. foliosa* is a distinct species with long, narrow leaves and lilac-pink flowers. It is a robust grower, flowers freely late into the autumn, and requires a well-drained position, facing full south. It should be planted in a crevice, in a compost of good gritty loam and limestone. *A. Laggeri* will grow best in a position where it is shaded from the midday sun, and should be planted in good, deep, gritty, peaty soil, top-dressed in the spring and autumn. It may be increased by seeds and division. *A. glacialis*, a plant from the high Alps, with lilac flowers, is quite at home in the moraine garden, but may be grown in a compost of gritty loam, leaf-mould, and peat in equal parts. It should be top-dressed in spring and autumn, and increased by division and seeds. *Douglasia Vitaliana*, from the Pyrenees, is a choice alpine of compact habit, with golden-yellow flowers. Its requirements are similar to those of *A. glacialis*. *A. carnea* and *c. alba* are both of very easy growth, especially as their leaves are not woolly,

but form dense spiny cushions of green. They flourish in any gritty soil.

Saxifraga is a very large and interesting genus; the species are mostly of easy cultivation. There are several distinct sections: the Mossy, the Encrusted, the Umbrosa, the Large-leaf Siberian, and the *Saxifraga peltata* group for the bog garden. The Mossy varieties are all easy to grow; any soil may serve, but the best is a good gritty loam, with leaf-mould and mortar rubble. They increase very quickly by division and soon cover up the bareness of the rockery, making beautiful patches of soft mossy foliage, bearing masses of flowers in the early spring. They will grow in almost any position, but should be sheltered from the midday sun or in half shade, and planted near the stones, as they prefer that to the cold, damp soil. Seed seldom comes true. *S. bathoniensis*, *S.* 'Red Admiral,' *S. sanguinea superba*, and *S.* 'Guildford Seedling' are four of the best red ones. *S. Stansfieldii*, *S. caespitosa*, and *S. Wallacei* are good whites; the last is the best and largest. *S. muscoides Rhei*, *S. m. densa*, and *S. m. atropurpurea* are similar and all good. The Encrusted section forms rosettes of foliage. The leaves are of a rather leathery texture, toothed, and encrusted with a silvery-white calcareous edging. The spikes rise from the rosettes in handsome sprays. These Saxifrages should be planted with great care in crevices of rock facing full sun, in a deep gritty compost with a little mortar rubble or limestone. *S. apiculata* and *S. Elizabethae* may be described as spiny cushions. They form little mounds of hard, minute rosettes, from which spring the spikes of flowers early in the spring. They must be so placed as to be sheltered at midday from the sun, and protected from north-east winds. Plant them in crevices of rockwork where no wet can lie about them. They bear a mass of yellow flowers early in the spring. *S. Burseriana Gloria* is by far the finest of all the *Burseriana* varieties. It produces flowers of exquisite whiteness, measuring 1¼ inches across. It should be planted in a sheltered nook protected from the north-east winds under the ledge of a rock, where it is protected from the heavy rains in the spring, which soon destroy the beauty of the flowers. *S. Burseriana* and *S. Boydii* require rather more care than the ordinary *Aizoon* varieties, and should be planted between stones and in full shade. Let them have a compost of good, gritty, fibrous loam (the fine being sifted out), leaf-mould, rock stone, and mortar rubble. Plant firmly and increase by cuttings or division. *S. Griesbachii* is a very distinct introduction from Siberia, somewhat like *S. media* in the leaves and habit, but with redder flowers and stems. The whole of the centre of the rosette develops into a flower-spike which, like the flowers, is bright crimson. The young growths appear later at the base of the flowered crown. It is very important to plant this species so that it does not suffer from damp. It is best grown on small cones of stones or in horizontal crevices with a sunny aspect, in a good, gritty compost; it may be increased by seed. *S. longifolia*, from the Pyrenees, and rightly termed the 'Queen of Saxifrages,' has large

solitary rosettes of richly encrusted leaves, which increase in size until the plant produces its grand spike of snowy blossoms—and then dies. This habit of dying after flowering is the one drawback to a plant which is nevertheless well worth growing, both for its superb silvery rosette and its immense white flower-spike. It should be planted in crevices between the rocks in good gritty loam and limestone on the north side, so as to be protected from the midday sun. *S. oppositifolia* is a very distinct species, found in Wales and other mountainous parts of Great Britain. It forms carpets of green and bears bright rosy flowers. The species will grow in any position, but does not flower freely except in the sun. Plant on a sloping bank where moisture is accessible to the roots, and use a compost of good, deep, gritty soil with limestone or mortar rubble. When once established, top-dressing with a gritty compost is essential. *S. o. splendens* and *S. o. alba* are good varieties. *S. retusa* resembles *S. oppositifolia*, but is smaller in habit, with heads of brilliant crimson, narrow-petalled flowers.

The Saxifrages of the *Megasea* section, called the giant rock-foils, form a very important group. Their requirements are few, a sheltered position suiting them best. Foliage very large, attractive, and evergreen, and the massive spikes of flowers in early spring are very effective. *S.* 'Brilliant,' *S. cordifolia*, and *S. afghanica* are good varieties. *Saxifraga peltata*, a Californian species, is quite distinct, and should be grown in raised parts of the bog garden in a sheltered place. It has a thick, fleshy root, and bears large round heads of pink and white flowers before the leaves, which are a bright green, and are toothed and lobed; an established plant will bear a flower-spike up to 3 feet high.

Onosma echioides ('Golden Drop') is a very beautiful plant for the rock garden, where it should be planted in sloping vertical fissures, so that no wet can lie about it, and in a hot sunny position, where it is protected from moisture overhead. It does best in well-drained, good, deep, gritty soil, and in summer bears forked drooping clusters of amber-coloured drop-shaped blossoms of delicious fragrance.

Campanula (Bell-flower) is a very large and popular genus The alpine species are charming for the rock garden, being as a rule not difficult to cultivate; some are very easy and free growers. *C. pulla*, which is the most lovely of the dwarf species, bears a profusion of rich deep violet flowers. It is most useful planted in crevices and between stepping-stones. *C. pusilla*, *C. p. alba*, and *C. p. pallida* are of creeping habit, and like chinks between sloping stones. *C. garganica*, *C. g. alba*, and *C. g. hirsuta* are natives of Italy, compact and tufty plants, the flowers in branching racemes. *C. pulloides*, a rare and splendid hybrid, has large cup-shaped flowers of even deeper colour than *C. pulla*. *C. Portenschlagiana* (syn. *muralis*) is a pretty Dalmatian species of tufty habit, with small crisp leaves, covered all the summer with light blue flowers, and is quite at home when planted in rocky crevices. *C. Stansfieldii* and *C. Tommasiniana* are Campanulas which do well planted in small pockets, where they soon become established

C. collina is a pretty, neat-growing plant, bearing flowers of deep blue; it should be grown in well-drained compost of brick rubble in a sunny position. *C. excisa*, *C. cenisia*, *C. Waldsteiniana*, *C. acutangula*, and *C. Zoysii* are all rare and beautiful species, and not much seen in the rock garden. They are more difficult to grow than the others mentioned, and require a well-drained, sunny position, in a good gritty compost, and should be top-dressed twice a year. They are quite at home in the moraine.

Sedum (Stonecrop).—Although many in this extensive genus are weedy and worthless plants, a great number are exceedingly attractive and indispensable for the rock garden. Nearly all Sedums prefer poor, gritty soil, in full sunshine. *S. oreganum* (= *obtusatum* of gardens) is a Californian plant with bright emerald-green leaves, which take a crimson tint in autumn and winter. The crimson stems bear yellow flowers; it should be planted in full sun. *S. pulchellum*, an American Stonecrop, is a pretty species with rosy-pink flowers arranged in several spreading and recurved branchlets, bird's-foot fashion, with numerous spreading stems. It requires a shady and rather damp position on the flat. *S. kamtschaticum* and *S. k. variegatum* are two good plants, and should find a home on every rock garden. *S. spathulifolium*, a North American species and one of the best, has dense rosettes of fleshy glaucous leaves and pink stems bearing yellow flowers. *S. Sieboldii* is a Japanese species with semi-erect stems clothed with round leaves borne in threes, and with terminal heads of pink flowers. It is best planted behind a stone where it can hang over, in a sunny sheltered position; in the autumn the glaucous foliage will change to a rosy-coral hue.

Dianthus.—The ' Pinks ' are almost all easy to grow. They prefer gritty limestone soil, and chinks between stones or well-drained ledges. The tufty species should be packed between sloping stones or in upright or horizontal strata. *D. alpinus* and *D. cal-alpinus* are lovely alpine plants with very large flowers. They require a south aspect, sheltered from midday sun, in good deep fibrous loam, grit, and leaf-mould (not too dry); top-dress every autumn in a similar compost, and increase by cuttings and seeds. Wire-worms and slugs are very troublesome to these two plants. *D. glacialis* is a miniature species from the Alps, and *D. neglectus* is a dwarf tufty species with large clear pink flowers. The true form has the underside of the petals a soft buff colour. These two are the prettiest of all the *Dianthus*. They should be given a south-west aspect in crevices low down, so that the roots get plenty of moisture, in a compost of gritty loam; increase by cuttings, division, and seed. *D. Freynii*, from Hungary, is probably the smallest *Dianthus* we have, but a very interesting one on account of its small, bright flowers, and neat, compact habit. It thrives best on a sunny bank, and, like all the Pinks, needs top-dressing once or twice a year. *Dianthus* is a large and varied genus, and there are many other species which should find a home in the rock garden, such as *D. caesius*, *D. deltoides*, *D. arenarius*, *D. dependens*, and *D. graniticus*.

Nierembergia rivularis, from Argentina, is a pretty little creeping plant producing large, white, cup-shaped flowers. It succeeds best in good strong loam, peat, and leaf-mould, in rather a moist position, with full south exposure; it should be top-dressed in the autumn.; increase by division.

Zauschneria californica and its var. *mexicana* are bushy little plants from California and Mexico, bearing vivid scarlet tubular flowers in late summer and autumn. They should be planted in a gritty compost containing limestone or mortar rubble, on a hot sunny bank; top-dress in late autumn or early spring. *Z. c. mexicana* flowers more freely than *Z. californica*.

Gentiana acaulis is perhaps the best known of its genus and one of the loveliest of alpine plants. It likes a deep gritty loam with limestone in it, in not too dry a position, but in full sun. It is glorious for massing on the rock garden, forming rosettes of sturdy green foliage, bearing great bell-shaped flowers on short stalks of a blue, the intenseness of which has become proverbial. There are gardens in which it is difficult to induce this lovely plant to flourish, but they are rather the exception than the rule; increase by division or seed. *G. verna* is a wonderful little alpine, growing an inch or two high and bearing white-throated star flowers of gorgeous sapphire-blue. It requires special treatment to flower it well. It does exceedingly well at Wisley, planted firmly in a flat position low down on the rock garden in a good, moist, loamy soil, grit, and limestone, protected from midday sun. It should be top-dressed once or twice a year.

Primula is a beautiful genus, and many of the species are quite easy to grow in the half-shady moist nooks of the rock garden in a deep loamy compost and a little leaf-mould. *P. frondosa* is quite happy, tucked away in a little damp corner, where it will flower freely. It does best by being raised from seed annually. *P. japonica*, *P. Bulleyana*, and *P. denticulata* are all easy to grow where there is moisture. *P. rosea*, when planted at the water-side, where its roots can get plenty of moisture during the growing season, soon flourishes and looks quite at home.

Only a comparatively few of the rarer and more interesting plants have been dealt with, as the common ones are so well known, such as *Aubrietia, Sempervivum, Arabis, Alyssum, Achillea, Viola, Anemone, Arenaria, Cyclamen, Erinus, Gypsophila, Iberis, Linaria, Oenothera,* Alpine Phlox, *Potentilla, Saponaria, Silene, Thymus, Tiarella, Armeria,* and many others, including a few of the many small bulbs, such as *Iris, Scilla, Chionodoxa, Narcissus, Hyacinthus*, all of which help to make a glorious show of flowers during the spring, and most of them are of easy cultivation and will grow in any ordinary garden soil.

It should be mentioned that it is most important, when planting, to put all roots down deep and plant firmly.

THE EARLY-FLOWERING CHRYSANTHEMUM.

By ROBERT FIFE, F.R.H.S.

[Read September 28, 1915; Rev. W. WICKS, M.A., V.M.H., in the Chair.]

THE subject engaging our attention this afternoon is "The Early-flowering Chrysanthemum," and I was, no doubt, invited to open the discussion upon it because I conducted in Scotland, in 1914, a very considerable trial of this popular autumn flower.

When I became aware that the Royal Horticultural Society had arranged for a trial of Early-flowering Chrysanthemums at Wisley, it occurred to me that a simultaneous trial in Scotland might be at least interesting, and probably beneficial, as the results obtained in the two localities could be compared. It is within my own knowledge that many varieties of Chrysanthemums—and other plants as well—which are successfully cultivated in the south are of no service to northern growers, but on this point I shall have something to say a little later on. You will quite understand that my remarks are based on my own northern experience, and if they run contrary at times to any recognized methods or results obtained in the south, it need not be inferred that either the one or the other is necessarily wrong.

If the characteristics of a popular garden plant are hardiness, dwarfness of habit, freedom of blooming, usefulness as a cut flower, and a range of colour embracing every shade except blue and intense scarlet, then the Early-flowering Chrysanthemum may lay claim to the distinction of being an almost perfect plant, because it possesses these qualities in a remarkable degree. This was not always so, and it is only in recent years that the form, colour, and habit of the flower have made marked improvement. It is an open question as to when the real Early-flowering Chrysanthemum made its appearance in Europe, but there is no doubt that it was in the form of the Pompon section, and that from this class, by judicious hybridizing and selection, the present high standard has been obtained.

It is a somewhat difficult matter to get at the early history of the Early-flowering Chrysanthemum. Conferences were held in 1889 and 1905, and the contributions of the late Mr. W. PIERCY to the former, and of Mr. HARMAN PAYNE to the latter, are the only permanent records that I have been able to find which have any bearing on the early history of the plant under review. Much of the historic information which I am able to give here has been drawn from these excellent papers.

Early flowering in Chrysanthemums may be taken to relate to those varieties which come into bloom out of doors in a natural way by the

middle of October at the latest. Reputed early varieties were mentioned so long ago as 1821–2, but, as Mr. HARMAN PAYNE points out, these terms were relative only, and there is no indication of the plants being in flower before November. It is interesting to note that in the year 1817 the Royal Horticultural Society offered rewards "for particular instruction on the growing of Chinese Chrysanthemums in England, so that they might be induced to produce their flowers early and well."

According to Mr. HARMAN PAYNE, who writes with authority, a Pompon variety was introduced from China about 1846, and this became the basis upon which the French raisers carried on their great work. It is said that in 1850 a French grower had some varieties which bloomed in August, but it is not until 1852 that any trace of the Early-flowering Chrysanthemum appears in this country. Another authority says that the first of this section was raised in 1853 by a Mons. PELÉ, and sold by him to a London nurseryman for £20. In the year 1858 one of the leading English growers wrote an article on "Summer-flowering Pompons," and gave a list of some thirteen varieties, while the late Mr. SHIRLEY HIBBERD about the same time mentions some twenty varieties, mostly French raised. In 1865 several varieties are named which keep up the succession of bloom from June till October. It has been said that the variety grown under the name of 'Little Bob' has been in cultivation for a very long time, but growers differ as to the date of its introduction. The late Mr. PIERCY said that its real name was 'Dr. Bois Duval,' but it had been re-named 'Scarlet Gem.' I am informed that the name 'Little Bob' was given to it in 1878 by the late Mr. HENRY CANNELL. So far varieties with small flowers only had been introduced and the origin of some of them is wrapped in mystery, owing to a want of system in their distribution. 'St. Crouts' came into Mr. PIERCY'S hands from Guernsey in 1878, but it is believed to have been raised in France. 'Lyon,' 'Madame Jolivart,' and 'La Vierge' were sent out in 1881, and the first of these by LEMOINE. 'Blushing Bride' came to Mr. NORMAN DAVIS, I believe, in 1885, in what is described by Mr. PIERCY as "a lot of rubbish from France." 'Piercy's Seedling' was raised by Mr. PIERCY from a packet of seed saved by Mr. THORPE of New York, and 'Golden Shah' by the late Mr. T. S. WARE.

The first of the large-flowered or Japanese varieties is said to have been raised by M. BOUCHARLAT of Lyons, and sent out by him about 1875–6. It is suggested that 'Madame C. Desgranges' was raised by this grower, but Mr. NORMAN DAVIS is rather sceptical on the point because 'Madame C. Desgranges,' to his knowledge, came into this country in 1876 or 1877 as a gratis plant from M. LEMOINE, and M. BOUCHARLAT did not list it until some ten years later. Another writer says that it was *discovered* in a garden in Wales in 1879. Whatever be its history, it was an excellent variety in its day, and gave such sports as 'Gustave Wermig,' 'Mrs. Burrell,' and 'Mrs. Hawkins,' varieties also of equal importance. This marked quite a new era in

the cultivation of the Early-flowering Chrysanthemum, and a great stimulus was given to the raising of new sorts. From 1880 to 1895 new varieties of considerable merit with comparatively large flowers made their appearance, one of the best known being 'Roi des Précoces,' a variety until recently in general cultivation on account of its decided crimson colour—a shade awanting in the earlier introductions. In 1891 a French raiser sent out no fewer than one hundred and twenty-five new early varieties.

While many French growers were engaged in the raising of new kinds, we must not forget that there were equally enthusiastic cultivators and raisers in our own country, and the names of such men as the late Mr. CANNELL, Messrs. DAVIS, GODFREY, GOACHER, HOLMES, JONES, WELLS, and YOUNG of Edinburgh, will ever be associated with the Early-flowering Chrysanthemum as we know it. The last-named gentleman gave us such good things as 'Caledonia,' 'Hector,' 'Cynthia,' 'Artemis,' 'Craigmillar'—the stand-by of the Edinburgh Parks—' Stella,' and a number of other well-known sorts.

While the Pompon Chrysanthemum held the field for many years and is still cultivated to a considerable extent for special purposes, it was certainly the introduction of the large-flowered varieties that popularized the Early-flowering Chrysanthemum. ' Madame C. Desgranges ' and its sports have already been referred to, but the introduction of ' Madame Marie Masse ' into the country about 1891 brought about quite a revolution in the growing of this plant. A new era had dawned upon it because we had in this an introduction of wonderful constitution, a perfect habit, and most profuse in its flowering qualities. This variety was highly commended by the Royal Horticultural Society at the trial in 1897, and received an Award of Merit in 1898.

I have previously referred to ' Madame C. Desgranges ' being " discovered " and to other varieties being " found " as it were from home. Is there any of this curious history about ' Madame M. Masse ' ? The Rev. W. WILKS was good enough to write me a year ago about a variety he had cultivated in his garden since 1879 under the name of ' Emperor of China, ' and I thought at the time that it resembled ' Madame M. Masse, ' but I am assured by Mr. WILKS that he knew it long before the introduction of the variety in question, and he believed that it was given to his father in 1859 by the Rev. JOSHUA DIX. Mr. WILKS sent me a root, and the produce is by universal consent the same as 'Madame M. Masse.' Is it possible that 'Madame M. Masse' also was, like 'Madame C. Desgranges,' "discovered" and sent out under a new name? Let the origin be what it may, the many valuable sports produced by it and its varieties would make a nicely varied collection in itself, but the introduction of improved varieties did not end here, and in recent years there has been quite a flood of new things, many of which do not hold the field for long.

In 1897 the Royal Horticultural Society had a trial at Chiswick, and 141 stocks were sent in. At the conclusion of that trial some

28 Pompon, 22 Japanese, and 4 reflexed varieties had been honoured with awards, the preponderance at that time being of the Pompon class. It is interesting to note that only one of the Japanese varieties is in general cultivation to-day, and that is 'Madame M. Masse.'

The cultivation of the Early-flowering Chrysanthemum is of the simplest kind, and I think that the best results are obtained on moderately rich land. This quality, in addition to the fact that it succeeds in a smoky atmosphere, makes it available alike for the garden of the cottager and the millionaire, and some of the finest displays are to be found around the humble homes of our country people.

There is considerable diversity of opinion as to the best times and methods of propagation, and also the correct time for planting out the Early-flowering Chrysanthemum, and I dare say the advocates of the different courses have good grounds for their beliefs. For many years I have observed that cuttings put in during December and January come into flower much later—as a general rule—than those propagated in February, March, or even April. This seems to some extent unnatural, but it is a reality all the same. I have had this question discussed at a meeting of the Scottish Horticultural Association in Edinburgh, and while the facts were admitted by all, not one even amongst the scientific men was able to account for them.

After I had been invited to introduce this subject to-day I set myself to carry out a series of experiments with the view to securing any possible information, and of getting comparative results, some of which I am able to show you here to-day.

My first object was to secure a few representative varieties, and I selected 'Bronze Goacher,' 'Framfield Early White,' 'Improved Masse,' 'Mrs. Wm. Sydenham,' 'Madame M. Masse,' 'Polly,' and 'Wells' Scarlet,' all quite distinctive in their way. I commenced to take cuttings on October 27, and continued the practice at monthly intervals until the end of March. In every case but the last the same general treatment was accorded to the cuttings, and eventually to the rooted plants. When the cuttings were sufficiently rooted they were potted into 3-inch pots and grown cool until planting time. In the case of the earlier lot I had a number of plants re-potted into 5-inch pots for the purpose of ascertaining whether their being grown on thus would make any considerable difference in the date of flowering. The foregoing were all planted out on May 5. The exception in the case of the last batch was that they were not potted, but planted out direct from the boxes on May 25.

I may say that in each separate test I grew one set of plants naturally, another had the centres pinched out, while others were cut back more or less, and in several instances these various operations were performed at quite different times, in order to ascertain how far the date of flowering was affected by them.

However much I should like to, it is impossible in the time at our disposal to go over in detail the general results obtained by this trial,

but I will take one representative variety and endeavour to show you the eccentricities, if I may so speak, of the same variety under different forms of treatment. The variety I select is 'Madame M. Masse.'

Taking the earliest set—that of which cuttings were inserted in October, and which were subsequently potted into 5-inch pots, I find that the plants as a general rule made one natural break, and were in good bloom on the terminals by September 7, and the plants of the same batch which were retained in 3-inch pots and grown naturally have made one break and were blooming on terminals on the same date.

The succeeding lot, propagated on November 27, made one natural break, and came into flower about September 1. Plants raised from cuttings taken on December 31 are varied in the number of breaks, some making one and others two, those making one break being in fine bloom on September 10, others two weeks later. The January lot made no breaks and were in good flower by September 1; the February set made no breaks and flowered on terminals by August 1. Cuttings taken at the end of March produced flowers on terminals about September 7.

'Improved Masse,' 'Mrs. W. Sydenham,' 'Polly,' and 'Wells' Scarlet' gave very similar results, but in the case of the last two new side-growths appeared on the earliest-flowering plants, and at the end of September they were in full bloom again. In a few cases where the plants naturally made one break, pinching seemed to anticipate this event, and the new shoots flowered somewhat earlier. 'Bronze Goacher,' however, did not respond in the same way. This variety made two breaks on the earlier-struck plants, and one break in the case of the latest, the earliest set to flower being those propagated in December. 'Framfield Early White' makes three breaks in the earlier stages, two in the others, and even in the last propagated set one and two breaks are recorded, the result being that most of the plants under very varying treatment will flower about the same time—the middle of October.

It will be observed that the earlier the propagation the greater the number of natural breaks, and within certain limits the plants are later in coming into bloom. Why plants produced from cuttings of the same variety should behave thus is a matter for scientific men, but so far no explanation that I know of has been given.

One-year-old plants of 'Madame M. Masse,' growing in my own garden, had strong shoots about a foot in length when my experimental ones were planted out. These have made two natural breaks, one more than the trial set, and will not flower until the beginning of October. Why this should be I know not.

It may be interesting to note at this point that in the case of the earlier varieties cuttings taken in December, or old stools pulled to pieces in the same month and grown on in slight heat, will bloom on terminals in April and May without making a single natural break. Flowers produced in this way have been shown by my firm in Edin-

burgh and London, and declared to be quite equal to those usually seen in September.

In the experiments already referred to I indicated that I had pinched one lot of plants and cut back another in each set, and the results have been that, as a general rule, the pinched plants are approximately one to two weeks, and the cut-back plants two or three weeks, later in flowering than those grown naturally, with no other beneficial result, except dwarfing, to compensate for loss of time.

The lesson I have had confirmed by this experiment is that, where plants are wanted to flower early, the cuttings as a rule should be put in during February; earlier propagation will give larger plants and somewhat later results. Trade growers can hardly leave the whole of this work until February and March, and if they did I fear their customers would not consider whether the plants were to bloom early or not, but the size of the plants when received would command their first attention, and their comments would be in accordance with their views of what a plant should be.

The best time for planting out is one on which opinions are varied. In response to demands, we send out our Chrysanthemum plants from the end of April onwards, and our own stock is always planted early in May. If the plants are carefully hardened off, I rarely find that any difficulties arise. Many southern growers advise the third week in May as the correct time, and their opinions must be respected. The weather conditions for a week after planting have a deal to do with success or failure.

I am a strong believer in comparative trials of all classes of Florists' flowers and Vegetables where a large number of varieties exist, and in my opening sentences I referred to a trial of Early-flowering Chrysanthemums which I conducted during the summer of 1914. In addition to my firm's stock I purchased from various sources all the varieties which I could obtain, and after classifying these to sections and colour I had them planted in ordinary garden soil—six plants of each variety. In trials of this kind the leading shades of colour should be planted together, for convenience of comparison and inspection. The plants were grown naturally, and when the largest number were at their best—September 22—they were examined by four experts, who gave such marks as seemed good to them. The varieties under trial were 328, namely 190 Japanese, 39 Pompons, and 99 Singles.

I will give the names of those that received marks in their respective colours:—

White:—XXX 'Artemis,' 'Cranford White,' 'Doris Peto,' 'Tuckswood Early,' 'White Countess.' XX 'Auguste,' 'Framfield Early White,' 'Grosvenor,' 'Hermine,' 'La Neva,' 'Market White,' 'Pluie d'Argent.'

Creamy White:—XXX 'Cream Perrière,' 'White Masse.' XX 'Perle Châtillonaise.'

Primrose:—XX 'Ethel.'

Pale Yellow:—XXX 'John Bannister.'

Deep Yellow:—XXX 'Carrie,' 'Elstob Yellow,' 'Horace Martin,' 'Leslie,' 'Champ d'Or,' 'Maggie,' 'Miss B. Melville,' 'Orion,' 'Polly.' XX 'Curtis Martin.'

Blush:—XXX 'Cynthia,' 'L'Yonne,' 'Normandie.' XX 'Blush Beauty.'

Rosy Pink:—XXX 'Lillie,' 'Madame C. Perrière.' XX 'Calliope,' 'Dolly Reeves,' 'Dorothy Ashley,' 'James Bateman,' 'Madame M. Masse.'

Rosy Lilac:—XXX 'Improved Masse.'

Chestnut:—XXX 'Almirante,' 'Mrs. Willis.' XX 'George Bowness.'

Crimson:—XXX 'Crimson Diana,' 'Crimson Polly,' 'Goacher's Crimson,' 'Kuroki,' 'Mrs. Wm. Sydenham.'

Crimson Scarlet:—XXX 'Wells' Scarlet.'

Terra Cotta:—XXX 'Abercorn Beauty,' 'Orange,' 'S. F. Richmond,' 'Verona.'

Bronze:—XXX 'Bronze Goacher.' XX 'Mrs. J. Fielding,' 'Nina Blick.'

Orange Bronze:—XXX 'Diana,' 'Harrie.'

Pompon Varieties:—*White*: 'La Vierge,' *Yellow*: 'Craigmillar,' 'Flora,' 'Mignon.' *Bronze*: 'Mrs. E. Stacey.' *Pink*: 'J. B. Dubois.' *Blush*: 'Mr. Selly.' *Crimson*: 'Little Bob,' 'Fred Pelé,' 'Toreador.'

Single Varieties:—*White*: 'Marion Bannister,' 'White City,' 'Walton Bradbury.' *Yellow*: 'Ada Nice,' 'Brightness,' 'Joan Carter,' 'The Moon.' *Orange*: 'Wells' Pride.' *Bronze*: 'Eric.' *Salmon*: 'Canada.' *Terra Cotta*: 'Dr. Ingram,' 'Holmthorpe.' *Blush*: 'Brazier's Beauty,' 'Daisy Bell.' *Pink*: 'John Woolman,' 'Pink Gem,' 'Early Rose.' *Purple Rose*: 'Dorothy.' *Chestnut Crimson*: 'Alexander,' 'A. J. Foster.' *Crimson*: 'Dazzler,' 'Kate Westlake,' 'Merstham Glory,' 'Ruby.' *Fiery Red*: 'W. A. Cull.'

(The Single Early-flowering Chrysanthemum is a very interesting class, but want of time, and not lack of appreciation, prevents me from dealing with it to-day as a separate item.)

I have been told that too many selections were made in some of the colours, but one must take into consideration what the grower's requirements are, and there is no one all-round variety. If I were asked to name a white, I would say 'Caledonia' for an exhibitor, 'Tuckswood Early' for garden display, 'Market White' for cutting, and 'Artemis' where a dwarf bedder was required. In yellows I should select 'Polly' for an exhibitor, 'Elstob Yellow' for garden, 'Leslie' for cutting, 'Maggie' for bedding, and so on.

When I sent copies of the report to growers in the south, and to the Horticultural Press, comments were freely made as to the absence of this, that, or the other variety which does well in the south of England, and for this I was quite prepared. The one variety which every writer referred to was 'Roi des Blancs,' a never-failing stand-by in the south, but which has never to my knowledge done well in any part of Scotland.

The result of my trials not only of Chrysanthemums, but also of

Dahlias and Violas, during 1914, showed conclusively what I had known for years, that trials made in the south of England are not in many cases of material value as a guide to northern cultivators. The Royal Horticultural Society conducts trials at Wisley, and it will look like presumption on my part to make suggestions or give advice to a Society surrounded by the best experts of the day. Perhaps some of you have heard it said "that fools will on occasions rush in where angels fear to tread," and if on this occasion I play the fool I am quite prepared to take the consequences of my indiscretion in seeking to tread on hallowed ground.

Take, for example, the trial of Chrysanthemums conducted at Wisley and the one initiated by myself in Scotland. Even under the best conditions none of these was conclusive, although I venture to think that, for reasons which I will presently submit, my own trial was the more conclusive of the two for my part of the country.

(The number of lots sent in, by the way, was 584, and of these 249 were Japanese kinds, 113 Singles, and two only of Pompons, a remarkable contrast to the previous trial. In all, 403 varieties were represented.)

I have already endeavoured to show you the great difference in the times of flowering due to earlier or later propagation, and it is conceivable that the plants sent to Wisley for trial were propagated at very varying dates and consequently bloomed earlier or later accordingly. This is borne out by the fact that in several instances varieties which are sports from the same source, or which usually flower about the same time, are recorded as blooming many weeks apart. The reason why I favour the results of my own trial is that a large number of the varieties were propagated on the spot and at the same date. My stock plants also are propagated at one time, and I have thus an opportunity of making more careful comparisons than if a mixed lot were grown. Then, again, there was the season at Wisley, which was all against the plants appearing in their true character so far as growth is concerned, although it ought not to have affected the rotation of flowering. Take the variety 'Galatea,' for example: this is at its best in Scotland at the end of August or early September, but it is recorded at Wisley as the end of September. 'Bella McNeil'—a sport from 'Lizzie McNeill'—'Stella' and 'Lizzie McNeill' all flower in the north in August or very early September, and the Wisley report says early September, mid-October, and late October respectively. I could easily give other instances, but these may suffice. The three varieties last mentioned are in Scotland poor, weak, and straggly growers—with fine flowers, however—and I was surprised to note that 'Stella' received an Award of Merit when under trial.

In my opinion, any Chrysanthemum—or even a Dahlia—trial should be continued over two years to get anything like reliable results. Where plants are grown from seeds one year will generally be sufficient to bring out any merits, or the reverse, but with such subjects as

Chrysanthemums or Dahlias it is quite different. With the former I have already dealt; in the case of the latter, plants produced from pot roots, early or late-struck cuttings, even although receiving equal treatment at the place of trial, will most probably flower weeks apart. This was observed in the great trial at Duffryn, where many sorts were not in flower at the date of inspection, or did not bloom at all. The lesson to be learned from this is that plants for trial should be received in one season, and any necessary notes for future guidance taken. In the succeeding spring every variety would be propagated under equal conditions, and may I also suggest that the plants should be grown as far as may be possible in batches of similar shades of colour? This arrangement has been successful in my own experience, and is a great convenience to everyone. As the Early-flowering Chrysanthemum is a popular garden plant which has to exist on ordinary soils, it will be quite in keeping with its usefulness if trials are carried out, as at Wisley, on the ordinary soil, and not, as many trials are, on specially prepared material, which must give a sort of artificial character to the test and prove misleading to growers under ordinary conditions.

The Royal Horticultural Society has not, I fear, a very strong hold in Scotland, and I am not sure that the Society has a great following in the northern portion of Great Britain as things exist. I should like to see it more popular there, and many years ago I advocated the advisability of closer association with northern growers. I think that this now powerful Society should consider whether anything can be done to establish a trial ground on a limited scale in some part of the North. The neighbourhood of Edinburgh would be a good centre, and soil of a good natural character, requiring no great outlay to put it in order, could easily be obtained. In such a place duplicates of many of the Southern trials could be made at comparatively little expense. Potatos, for example, are tested by authorities in various parts of the country before they can be certified as fit for general cultivation, and the same rule holds good as to other vegetables and flowers. In the meantime it is quite impossible for the North of England Horticultural Society or any of the Scottish Horticultural bodies to take up the work, through lack of funds. I commend the idea to the Council.

EARLY CHRYSANTHEMUM TRIALS.

Name of Variety.	Date of Propagation.	Number of Breaks.	In full Flower.	Average Height.
'Madame M. Masse'*	Oct. 27	1	Sept. 7	27 ins.
„ .	Oct. 27	1	Sept. 7	27 „
„ .	Nov. 27	1	Sept. 1	36 „
„ .	Dec. 31	1–2	Sept. 10–20	42 „
„ .	Feb. 2	0	Sept. 1	28 „
„ .	Feb. 27	0	Aug. 1	21 „
„ .	April 1	0	Sept. 7	25 „
'Mrs. W. Sydenham'*	Oct. 27	3	Sept. 7	28 „
„ .	Oct. 27	3	Sept. 10	28 „
„ .	Nov. 27	3	Sept. 20	28 „
„ .	Dec. 31	3	Sept. 25	30 „
„ .	Feb. 2	2	Sept. 28	30 „
„ .	Feb. 27	0	Aug. 1	24 „
„ .	April 1	0	Sept. 7	24 „
'Improved Masse'* .	Oct. 27	1–3	Aug. 1–Sept. 20	31 „
„ .	Oct. 27	1–2	Aug. 20–Aug. 30	30 „
„ .	Nov. 27	1	Aug. 20	24 „
„ .	Dec. 31	1	Sept. 10	35 „
„ .	Feb. 2	1	Sept. 10	34 „
„ .	Feb. 27	0	Aug. 15	24 „
„ .	April 1	0	Sept. 7	20 „
'Polly'* . .	Oct. 27	1	July 26–Aug. 15	24 „
„	Oct. 27	1	Aug. 15	24 „
„	Nov. 27	0	July 26–Aug. 15	30 „
„	Dec. 31	0	July 26–Aug. 15	25 „
„	Feb. 2	0	Aug. 20	27 „
„	Feb. 27	0	Aug. 20	27 „
„	April 1	0	Aug. 20	24 „
'Wells' Scarlet'* .	Oct. 27	2	July 26–Aug. 15	26 „
„ .	Oct. 27	2	Aug. 20	26 „
„ .	Nov. 27	1	Aug. 20	27 „
„ .	Dec. 31	1	Aug. 15	25 „
„ .	Feb. 2	1	Aug. 20	26 „
„ .	Feb. 27	1	Aug. 20	20 „
„ .	April 1	0	October	24 „
'Bronze Goacher'* .	Oct. 27	2	Sept. 7	40 „
„ .	Oct. 27	2	Sept. 20	40 „
„ .	Nov. 27	1–2	Sept. 7–Sept. 20	34 „
„ .	Dec. 31	2	Sept. 7	33 „
„ .	Feb. 2	2	Sept. 7–Sept. 25	33 „
„ .	Feb. 27	1–2	Sept. 20–Sept. 30	30 „
„ .	April 1	0	October	24 „
'Framfield E. White'*	Oct. 27	3	„	40 „
„ .	Oct. 27	3	„	40 „
„ .	Nov. 27	2–3	„	42 „
„ .	Dec. 31	2	„	42 „
„ .	Feb. 2	2	„	39 „
„ .	Feb. 27	2	„	40 „
„ .	April 1	1	„	36 „

Those marked * were potted into 5-inch pots.

In all cases it has been calculated as a break when the centre bud did not develop.

Varieties with double flowering-dates were irregular.

The flowering-dates given are those when plants were at their best.

LEAF VEGETABLES, AND HOW TO COOK THEM.

By C. Herman Senn, F.C.A., F.R.H.S.

[Read November 23, 1915; Mr. Joseph Cheal, V.M.H., in the Chair.]

There never was a time when food economies required to be more closely studied than the present. The entire vegetable world is calling out to housekeepers and cooks to give it a better show in the competition with the abnormally high-priced butcher's meat for human food!

Vegetables are essential to both good eating and good health, they possess great nutriment, and many of them valuable medicinal properties in addition.

The preparation, cooking, and consumption of vegetables should be made a special daily feature in every family, and there is no doubt that we should be better off, in both health and pocket, by consuming well-cooked vegetables more regularly.

Generally speaking, the use of vegetables counteracts the effects of the constant use of meats. It must of course be borne in mind that different vegetables have different nutritive values.

Haricot beans, butter beans, lentils, and peas, according to analysis, contain a good percentage of nitrogen, which is the flesh-forming element found in meat. On the other hand, they have a proportionate deficiency in heat-forming elements, which is a most desirable quality during the hot weather, while of salts they show about the same proportion as is found in meat.

Root vegetables, as well as herbaceous vegetables, contain a somewhat larger percentage of heat-producing elements than of nitrogen.

The appetite is excited by different vegetables according to the seasons. During spring and summer months vegetables which are classed as greens, and are bitter or sub-acid, are mainly in demand, while in autumn and winter it is rather the farinaceous kind which are most appreciated. It will thus be seen that Nature offers her gifts just when they are at their best and the human system calls for them. It is indeed only civilization that has created the products out of their season, when they possess only an imperfect imitation of the naturally grown products.

Compared with other articles of diet—fish, meat, and poultry—many vegetables when properly cooked can be converted into correctly balanced food at about one-third the cost. They are, when in season,

plentiful and cheap, but it is the way in which they are cooked and presented at table that will decide whether they are nutritive, appetizing, and wholesome, for it is not what we eat that we live on, but what we digest.

On previous occasions I have had the pleasure of speaking about Roots and Tubers,* and Stem Vegetables.† The present lecture is to be devoted to the third group, *i.e.* "Leaf Vegetables." The numerous members of the *Cabbage* tribe are, of course, the chief representatives of this section. After the potato, cabbage is the most popular vegetable. Its moderate price puts it within the reach of all classes, and, what makes it still more valuable, it can be procured all the year round. The blood-purifying properties in which it so richly excels are due to the valuable potash salts and phosphates contained in its composition. Great care is therefore needed in the cooking so that these salts shall not be carelessly dissipated. Stewing or steaming are far preferable to boiling. The water in which greens have been cooked holds a large quantity of these salts in solution, so that, in spite of its disagreeable odour, cabbage water forms a purifying drink to the system. Cabbage, or greens of some kind, should be eaten at least once daily. All greens require particularly careful looking over, and soaking in salt and water preliminary to cooking, because of the insects concealed in them.

Some of the many varieties of the cabbage tribe are the *White Cabbage*, *Borecole* or *Scotch Kale*, *Savoy*, *Cauliflower*, *Brussels Sprouts*, and *Red Cabbage*. The last named is principally used for pickling, but on the Continent, and sometimes in this country, it is eaten as a vegetable when stewed in rich gravy and butter, with vinegar and aromatic spice. Brussels Sprouts are really cabbages in embryo, which grow upon the leaf-stalks of certain kinds of cabbage. They are in season in the winter months, when other vegetables are scarce. Cauliflower, though it should really be included under the heading of flowers, may be placed here for convenience. It is the most highly prized of all the members of the cabbage family. The large, bushy, snow-white heads of flowers are beautifully tender and sweet when properly boiled. It is more wholesome and more delicate in flavour than any cabbage, and, being easily digested, is particularly suitable for invalids or the aged.

The *Globe Artichoke* is a species of cultivated thistle. It is not very nourishing, but the fleshy receptacle, scales, and blanched leaf-stalks have an agreeable flavour, and are easily digested. The choke or centre portion is used for soups and entrées, and also as a high-class garnish. Several varieties of this vegetable exist, including the Laon artichoke, with its different-sized flakes or leaves, the flat and pointed Brittany, the violet—the Provence artichoke—and the red variety which grows abundantly in the south of France.

* *Journal R.H.S.*, vol. 38, p. 540. † *Ibid.*, vol. 39, p. 523.

Spinach is a favourite English vegetable, and is used in this country much as sorrel is in France, for clearing the complexion. Hence the proverb " Spinach and leek keep the skin sleek." The young leaves, and even the stems, are used either boiled or fried with butter, but they are best cooked in a purée. After the stem reaches maturity the leaves become bitter, and are then unfit for use. Its aperient qualities are due to the fact that it consists almost entirely of cellulose, and therefore proves beneficial in habitual constipation. Spinach is prepared and cooked in the same way as other green vegetables, except that the wet leaves are put into the saucepan without any water besides that which adheres to them.

Nettle tops and *young bracken shoots* serve the same purpose as spinach for purifying the blood, and may be cooked and served after the same methods. *Beetroot leaves* are also very similar to spinach. The young leaf of the *Mangold-wurzel* is also excellent when cooked, whilst wild sorrel added to pea-soup makes a pleasant change.

The many varieties of salad plants may be conveniently classed under one heading, inasmuch as the majority of them are eaten raw. *Lettuce* stands out pre-eminently as the Queen of Salads ; it is easy of digestion, and exceedingly wholesome. There are three forms, the cabbage lettuce, curly lettuce, and the Cos or Romaine lettuce. Eaten raw as a salad it is considered a cooling, anti-scorbutic, and slightly laxative article of diet, whilst, taken at supper-time, it is said to promote sleep. Lettuce is frequently cooked as a vegetable, or made into soups. *Chives*, as a salad ingredient or garnish, deserve a greater popularity. The leaves can be used as a substitute for young onions, and if chopped up very finely they also make a splendid flavouring for salads and sauces. *Tarragon* and *Chervil* are two little-known but extremely useful salad herbs. Chervil especially has very aromatic leaves, which make a good seasoning and a delicate garnish. The French use it for the basis of their dried herbal mixture known as " *Fines herbes*." *Sorrel* is another unfamiliar salad plant. In France great use is made of its leaves, but in England it is seldom met with, as it is considered bitter. This, however, may be obviated by using two waters. *Cress* and *Watercress* are well-known raw varieties used in salad-making. Both are extremely wholesome, and the latter is often used as a garnish for roast chicken, steak, &c. *Endive* is particularly useful for winter salads, when lettuce and other similar plants are scarce or unobtainable. It has long been naturalized in this country, but is cultivated much more extensively on the Continent, especially in Belgium. There are several varieties of this plant ; the cut-leaved or curled variety is usually prepared for salads in this country, but the dwarf white Batavian, commonly known as Belgian endive, is more delicate and agreeable in flavour. The petals of dandelions, again, deserve to be much more utilized for salad-making than they are by us in this country. They constitute one of the best of salads.

RECIPES.*

Boiled Cabbage.—Take off the outside leaves of the cabbage, cut it in quarters. Wash well, and let it soak for a quarter of an hour in salted water, to destroy insects which may be between the leaves. Cut off the stalk portion, and put the cabbage in a stew-pan of boiling salted water. Let it boil fast until tender, then drain in a colander or on a sieve. Press with a plate so as to extract all the water. Serve hot on a deep dish.

Creamed Cabbage.—Cook in salted water 2 small cabbages, previously picked, washed, and cut in quarters. When tender, drain and chop finely, put in a stew-pan with 2 to 3 oz. of butter, season with salt, pepper, and a little grated nutmeg. Stir with a wooden spoon over the fire for a few minutes. Lastly add a gill of cream, reheat, dish up, and serve.

Savoury Cabbage Pudding.—Wash, pick, and blanch one or two small cabbages for 20 minutes. Drain and press so as to extract all the water, then chop finely and season to taste with salt and pepper. Butter a charlotte mould, and sprinkle with breadcrumbs. Place in the bottom a layer of cabbage, then a layer of sausage meat. Fill the mould alternately with the cabbage and farce, taking care that the last layer is cabbage. Cover with slices of bacon, and cook in the oven for about an hour in a closed stew-pan, containing enough water to reach a third of the mould. When cooked, turn out the shape on to a deep dish, sauce over with hot Espagnole or Madère, and serve.

Cabbage Timbale.—Prepare and boil 1 large or 2 small cabbages in the usual way, then drain well in a colander, and press out the water. Chop the cabbage finely. Melt 2 oz. of butter in a stew-pan, fry in it a small peeled and chopped onion to a golden brown. Add a tablespoonful of flour, stir for a few seconds, and put in the chopped cabbage, also about 3 oz. of chopped ham. Season with salt, pepper, and grated nutmeg, and cook whilst stirring for about 10 minutes. Lastly, add a little cream. Butter a plain timbale mould, or a pudding basin, and besprinkle the inside with breadcrumbs, then line it with thinly cut slices of bacon. Fill it with the prepared cabbage, and bake for about 40 minutes in a fairly hot oven. To serve, turn out the mould on to a hot dish, and pour round it some hot and well-flavoured brown sauce.

Cabbage à la Crème.—The cabbage must be pulled to pieces and well washed; it is cooked in a saucepan of fast-boiling salted water; the flavour is improved if an onion is added; when soft drain well, and then rub through a wire sieve. Half an ounce of butter is next melted, and the cabbage added; also 2 tablespoonfuls of cream. It should be seasoned nicely with salt and pepper, and served very hot. If preferred as a separate dish, it should be garnished with toasted bread cut into fancy shapes.

* From *How to Cook Vegetables*, by C. HERMAN SENN.

Cabbage à la Viennoise.—Trim, wash, drain, and boil in slightly salted water a large cabbage. When done, strain off the water and chop the cooked cabbage rather finely. Cut about 4 oz. streaky bacon into very fine strips, fry them in a stew-pan with a little butter, add a small onion (peeled and chopped), and fry it to a golden brown. Next sprinkle in a tablespoonful of flour, stir well, and fry for a few seconds; then add the cabbage. Moisten with about half a gill of stock, season with salt, pepper, nutmeg, and paprika, cook slowly for about 15 minutes. Dish up, garnish the dish with fried bread croûtes, and serve.

Cabbage with Bacon.—Cook a piece of streaky bacon or salted pork with the previously prepaied cabbage; this gives it an excellent flavour. When the cabbage and pork are tender, serve the bacon or pork on a dish, surrounded by the cabbage, previously drained and cut into portions.

Braised Red Cabbage.—Cut the cabbage in quarters. Remove the outside leaves and the stalk, then cut the quarters in fine strips. Wash well, then blanch and drain. Chop 2 or 3 peeled onions, toss them in butter without browning, and add to the cabbage. Fry a few minutes, then add a small glass of brandy and two glasses of claret. Season with salt and pepper and cook slowly for about an hour. When the cabbage is cooked and the stock well reduced, it is ready to serve.

Savoury Red Cabbage.—Wash and trim one or two red cabbages cut in quarters, and remove the stalk, then shred finely. Put the cabbage in a stew-pan and cook till tender in slightly salted water. Drain well, and return to the stew-pan with enough good stock to prevent it from burning; season with salt, pepper, and a good pinch of allspice. Fry about 6 oz. of coarsely chopped bacon in a little butter or lard; add this to the cabbage. Allow it to simmer gently for half an hour, stir from time to time, adding a dash of claret or a little wine vinegar each time; this will change the colour of the cabbage to a deep red. Cabbage thus cooked is served generally with hot smoked sausages or boiled salt pork, which may be cooked along with the cabbage if liked. Corned or hung beef or grilled ham are likewise served with red cabbage, which forms a popular vegetable dish on the Continent.

How to Cook Spinach.—Pick and wash 2 lb. spinach, put it into a small quantity of boiling salted water, and boil until tender. When done strain on a colander, soak in cold water for a few minutes, drain again, and chop up finely. Melt 2 oz. of butter in a stew-pan, add ½ oz. of cornflour, put in the chopped spinach, season with pepper and a little grated nutmeg, stir over the fire until thoroughly hot, add a little milk, if too thick, dish up on a round dish and ornament a little, put a few pieces of toasted bread round the dish, and serve.

Creamed Spinach.—Cook about 2 lb. of trimmed and washed spinach in the usual way, drain it well, and rub through a fine sieve, or chop it very finely. Melt 2 oz. of butter in a stew-pan, put in the spinach, and stir it till quite hot; mix in 3 tablespoonfuls of Béchamel sauce and

3 tablespoonfuls of cream; cook gently for another 15 minutes, and use as directed. The seasoning should consist of very little salt, pepper, and a grate of nutmeg.

Spinach Pudding.—Rasp the crust from 2 French dinner rolls, cut the rolls into slices, and soak them in milk (pour over enough hot milk to just cover the bread). When sufficiently soaked squeeze the bread, and stir it in a basin into a fine pulp with 1 oz. of melted butter. Pick and wash 2 lb. of spinach, and cook it with very little water in a stew-pan, then chop it finely. Peel and chop a small onion, fry it to a light brown in about ½ oz. butter, to this add the chopped spinach and the soaked bread. Now stir in the yolks of 2 eggs, and season to taste with salt, pepper, and grated nutmeg. Lastly, whisk up the white of 1 egg, and stir lightly into the spinach mixture with 2 tablespoonfuls of the prepared breadcrumbs. Line a plain pudding mould, previously buttered and breaded, with very thinly cut slices of bacon, fill it up with the above, cover with a buttered paper, and cook in a fairly hot oven for about an hour. Turn out on to a hot dish, pour round a little hot gravy, and serve.

Spinach Gondolas.—1½ lb. spinach, 2 oz. butter, 1 large finely-chopped shallot, 1 tablespoonful flour, ½ gill cream, nutmeg, short crust or rough puff paste, 1 hard-boiled egg.

Pick, wash, blanch, cook, and drain the spinach, and rub it through a fine sieve. Fry the shallot lightly in the butter, stir in and cook the flour, add the spinach, a pinch of nutmeg, salt, pepper, stir till hot, add the cream, and keep hot. Line 12 boat-shaped moulds with ½ gill of gravy. Dish up, surround with a border of puff paste fleurons or croûtons ot fried bread, and serve.

Spinach Soufflés.—1 lb. spinach purée (cooked spinach rubbed through a fine sieve), 2 oz. butter, 1 tablespoonful flour, ½ gill cream, 1 oz. grated Parmesan cheese, cayenne or paprika pepper, salt, and nutmeg.

Melt 1 oz. of the butter in a small stew-pan, stir in the flour, cook it whilst stirring, but do not let it take colour; add a little stock or water, and work vigorously with a wooden spoon over the fire until it resembles a smooth paste; next add the cream, work again, and, lastly, put in the spinach purée. Season to taste with the above-named condiments, which must be used in small quantities only, in due proportions. When thoroughly mixed stir in half the grated cheese. Have ready some china soufflé cases, well buttered, sprinkle the inside with grated cheese, and fill them with the mixture. Cover the top with grated cheese, mix with an equal quantity of fresh breadcrumbs. Place a few tiny bits of butter on top of each, and bake in a very hot oven for 8 minutes. Dish up, and serve at once.

Spinach Timbale.—Pick and wash 2 lb. of spinach, and cook it with very little water, then drain and pass it through a fine sieve; press out the water, and put it in a stew-pan containing 2 oz. of butter kneaded with 1½ oz. of flour. Season with salt, pepper, and a little grated nutmeg. Then add a little milk and 1 tablespoonful of

Parmesan cheese. Stir well till slightly reduced. Lastly, add the yolks of 6 eggs. Mix thoroughly, reheat, and put into a well-buttered plain mould. Cover the mould with a buttered paper, place it in a stew-pan half filled with boiling water, and cook it very gently for about an hour or longer, and turn out when set on to a hot dish. Garnish the top of the timbale with rings of hard-boiled white of egg. Pour a little brown sauce round the base of the dish, and serve.

Brussels Sprouts Soup.—Cook about 1½ lb. of well-washed and trimmed sprouts in about 3 pints of stock, with a little spinach, to give the soup a good colour. When the sprouts are cooked to nearly a purée, pass through a fine sieve or a tammy cloth with the aid of two wooden spoons. Put the soup in a saucepan, boil, and skim well. Season with salt, pepper, and nutmeg, and finally add a little cream. Serve fried bread croûtons separately.

Brussels Sprouts with Bacon.—Fry 10 to 12 thin slices of streaky bacon in a frying-pan ; when done take up and keep hot. Put into the same pan about 1 lb. of cold cooked Brussels sprouts (well drained) and fry them in the bacon fat. Season with salt and pepper and toss them a little. Put the sprouts into a hot buttered pudding basin, then unmould on to a hot dish, surround with the fried bacon, and serve.

Endive au Gratin.—Belgian endive can be braised, like celery, but the best way to cook it is *au gratin.* Trim and wash the endive (6 or more heads) ; then blanch in salted and acidulated water, and drain. Butter a gratin dish, and pour a little white sauce in it, then place in the endive, season, moisten with a little veal stock, and cover with enough white sauce to coat. Sprinkle over some grated Gruyère and Parmesan cheese, bake in the oven until quite cooked, then serve.

Braised Endive.—Trim and wash about 4 large heads of endive, blanch them in slightly salted water, and drain them on a sieve. Cut each head in 2 or 3 portions, 4-in. lengths, tie up each with thin twine. Range them in a well-buttered sauté-pan, season with salt, pepper and nutmeg, and moisten with ½ pint of rich stock. Cut a few thinly-cut slices of streaky bacon into strips, fry them a little, and put these on top of the endive. Cover the pan and put it in a hot oven to cook the contents for about 30 minutes. When done, take up, drain the endive, and reduce the liquor or stock, adding to it a little Brown or Espagnole sauce, and a small piece of meat glaze. Dress the endive on a vegetable dish, strain over some of the sauce, and serve hot.

Braised Lettuce.—Wash, trim, and blanch about 6 lettuces, drain them on a cloth, and tie each with a small piece of twine, range them in a pan, add about a pint of stock, and braise them with 2 oz. of butter in the oven. When done take them up carefully, drain, and trim into shape. Reduce the stock to a half glaze, put in the lettuces, and place in the oven for 10 minutes (cover the pan with buttered paper). Glaze each head with the reduced stock, or else a little

dissolved meat glaze. Dish up in a circle upon croûtons of fried bread about the size of the lettuces. Have ready some thinly cut slices of fried bacon, garnish the dish with these, and serve hot.

Garbure of Lettuce.—Braise the lettuces and drain them. Prepare some thin slices of grilled bread and place in the bottom of a deep dish. Arrange the lettuces on the bread, then again with lettuce after, alternately, until the dish is full, making sure that the lettuce forms the last layer. Pour over some rich stock or gravy, and brown in the oven.

Lettuce à la Crème.—After having braised 6 lettuces, drain, press, and chop them finely. Melt 2 oz. of butter in a stew-pan, stir in 1 oz. of flour, and stir till a light brown ; then moisten with a gill of cream. Add the chopped lettuces to this, and cook slowly for about 10 minutes. Season and serve in a vegetable dish. Surround the lettuce with croûtons of fried bread.

Stuffed Lettuces.—Blanch some firm cabbage lettuces, previously trimmed and washed, in salted water, for about 5 minutes ; then drain, let cool, and press well ; split down the middle, and introduce in the centre a stuffing of pounded sausage meat, to which some chopped mushrooms have been added. Shape the stuffed lettuces neatly to give each its natural shape, and tie each with thin string. Then arrange in a sauté-pan lined with slices of bacon, a sliced carrot, 2 peeled and sliced onions, 2 cloves, and a *bouquet garni.* Moisten with stock, and season with salt and pepper : cover with slices of bacon, and braise for about 30 minutes or longer. When the lettuces are cooked, place them in a vegetable dish. Pour over some Madère sauce with an addition of lettuce stock previously skimmed and reduced, and serve hot.

Fried Lettuce Hearts.—Trim the lettuces, preserving only the heart and the white leaves. Cook as stated for braised lettuces. Drain and press in a cloth to extract the water. Shape each lettuce neatly. When cold, brush over with beaten egg, then roll them in breadcrumbs. Fry in deep fat to a golden colour, drain, dish up, and serve hot.

Braised Lettuces with Green Peas.—Wash, trim, and blanch 6 or 8 firm cabbage lettuces, braise them in some well-flavoured stock, take up, drain, trim again, and put into shape. Reduce the stock to a glaze, put in the lettuces, and finish in a moderate oven for 10 minutes (cover with buttered paper or stew-pan lid). Glaze each head with the reduced stock, or else a little dissolved meat glaze, dish upon croûtons of bread about the size of the lettuces, dress in a circle. Have ready some green peas cooked in salted water, strain, and put in the centre of the dish. Place a piece of fresh butter on top, and serve.

ANOTHER WAY.—Another way of cooking lettuces and peas is to shred the lettuces and cook them with the peas in salted water ; they are drained, then tossed in a sauté-pan over the fire for several minutes, using fresh butter for sautéing. A dessert-spoonful of flour is then sprinkled in and stirred, moisten with a little stock, and finish with 2 pats of fresh butter. Season to taste, dish up, and serve.

Lettuce Timbales.—Eight firm cabbage lettuces, 3 eggs, ½ gill rich gravy, ½ gill Madeira sauce, 2 oz. butter, ¾ oz. flour, ½ gill double cream, salt, pepper, and nutmeg.

Trim and wash the lettuces, boil fast till tender in slightly-salted water, drain, squeeze out the moisture, and chop them very finely. Melt 1½ oz. of butter in a stew-pan, add the flour, stir for a few minutes to cook the flour, then add the minced lettuces, moisten with the gravy, stir with a wooden spoon till the whole simmers; cook for a few minutes, remove the pan from the fire, and let cool a little; next add by degrees the yolks of 3 eggs and the whites of 2, also the cream. Season to taste with salt, pepper, and grated nutmeg. Fill up some well-buttered plain dariole or timbale moulds, stand them in a sauté-pan half filled with boiling water, and poach in the oven for 30 to 35 minutes. Unmould on a hot dish, and serve with Madeira sauce. This makes an excellent vegetable entremet, and as a garnish it is particularly adapted for such dishes as braised fillet of beef, fricandeau of veal, sweetbreads, braised lamb, neck or leg, or with almost any kind of remove or relevé.

THE HISTORY OF THE CLASSIFICATION OF APPLES.

By Edward A. Bunyard, F.L.S.

[Read October 12, 1915; Dr. F. W. Keeble, F.R.S., in the Chair.]

A classification of Apples has to many minds an academic and somewhat arid sound, and smacks rather of the study than the garden. Others again who are interested only in commercially profitable varieties would select these and consign others to limbo. Unfortunately, however, the discarded fruits refuse to be so disposed of, and when they turn up in old gardens it often happens that their owners wish to identify them. There are, furthermore, those whose interest in fruits resembles that of flower-lovers who like to recognize, let us say, British wild plants, irrespective of their medicinal or decorative value. To such some system of grouping the numerous varieties into convenient families will have interest and utility.

All students of Apples have their own system of recognition, unconscious as it often may be, and the veriest beginner confronted with a few score of different Apples will at once sort out the codlins and the russets &c.

It is quite evident that some sifting-out process is a great help, and it might almost be said that any classification is better than none in dividing the problem for the beginner into parts which can be separately attacked. It is not a little remarkable that while Mosses and Foraminifera have been accurately described and classified, the more useful fruits still remain in a state of unscientific confusion.

The student will find his Apples somewhat resembling the pre-Linnean flora, all species and no genera. All attempts at classification are but endeavours to provide genera and families and to group together the related.

A system based upon descent would of course be ideal, but exceedingly unlikely to be attained in a fruit like the Apple, whose history is so long and whose parentage so speculative. On the other hand, an artificial system, always so attractive on paper, fails when confronted by the actual fruits. It is sometimes urged that the differences in individual specimens make any attempt at an exact system impossible. It must, however, be urged, even at the cost of obviousness, that a classification is not an end in itself, but only a means to a better knowledge of fruits, and is the road rather than the goal. The object of this paper is to show the many attempts which have been made to devise systems, and the writer hopes that by showing the blind alleys perhaps some may be stimulated to search for the main road.

From the earliest days writers have attempted, when describing Apples, to place them in convenient groups. In THEOPHRASTUS we find the earliest system that has come down to us. His groups were Wild, Cultivated, Early, Late, Sweet, Epirote (those from Albania), and Dionysian.

The encyclopædic PLINY chose his divisions for geographical reasons mainly, but some of his classes are natural, as for example the Farina, a type of our early fruits which soon turn mealy, and the Melimela or honeyed fruits.

The herbalists of the sixteenth and seventeenth centuries also made efforts in the same direction, as in the "Historia Stirpium" of CORDUS, where the main classes were Rotunda, Globosa, and Non Rotunda, each being subdivided into Pulpa, Pulmentaria, Flava, and Duracina. JEAN BAUHIN, in his "Historia Plantarum" (1650), adopts a similar system, Rotunda, Oblonga, and Aliarum ; these being again subdivided into varieties major and minor.

A writer who is often credited with being the first to make a Classification of Apples is JOHANNES JOHNSTONUS, who published his "Natural History of Plants" in 1662. JOHNSTON was, however, but a compiler and in this matter borrowed from BAUHIN, and has no claim to our attention, notwithstanding repeated assertion in pomological text-books. The first writer who made a serious attempt was W. L. MANGER, who published in 1780 his valuable "Vollständige Anleitung zu einer Systematische Pomologie."

MANGER (fig. 111) was the son of a gardener at Leipzig, who studied Natural Science and Architecture, and received an official appointment as Superintendent of Buildings under Frederick the Great at Potsdam. As might be expected, the form of the fruit was in his eyes of considerable importance, and his first plan was mainly upon these lines.

His main classes were Round, Elliptical, Egg-shaped, Cylindrical, Flat, Hyperbolic, and Parabolic. The accompanying illustration (fig. 112) shows the frontispiece to his work and is of interest as being the first of its kind. In working out the details of his scheme MANGER found that it was not entirely satisfactory, and he therefore added other suggestions which are of a certain interest.

The first contained Apples with a rough or russet skin as distinct from the smooth-skinned. These were again divided into sweet with firm flesh or tender flesh. The final classes were according to flavour : astringent or harsh, wine-sourish, agreeably sour, and sweetish sour. The last two classes show all the characters of a paper classification, and when we meet further on with such divisions as "agreeably sweet" and "disagreeably sweet" it is easy to understand why MANGER's attempt did not long withstand the test of practical use. He claims attention as the first to publish a system and to work it out in full detail, and no doubt did much to stimulate his followers to further efforts.

The next writer of importance is J. V. SICKLER, who is best known by his "Deutsche Obstgärtner," a periodical which was produced from 1794 to 1816, and which was extremely popular in its time.

SICKLER experienced great poverty in his youth, and was successively baker, organist, and parson. The last occupation gave him the opportunity to study fruits, and his writings on this subject were both good and numerous.

His classification was similar in many ways to that of MANGER, and was based mainly on the proportions of height and breadth. The following table gives it in rough outline:—

System of J. V. Sickler.

CLASS I.
Height and breadth equal.

Order 1.	*Order* 2.
Round arch.	Shallow arch.

CLASS II.
Higher than broad.

Order 1.	*Order* 2.
Arch elliptical.	Arch cylindrical.

CLASS III.
Broader than high.

Order 1.	*Order* 2.
Arch flat.	Arch upright.

CLASS IV.
Narrow to eye.

Order 1.	*Order* 2.
Quite pointed.	Blunt pointed.

The objections to such a system are too obvious to require mention, and it was soon overshadowed by the work of CHRIST (fig. 113), which was published in 1797. This writer has hardly received the prominence he deserves in the history of the Classification of Fruits, as the first who made a real attempt at a natural system and to whom his followers owed much.

The son of a ducal official in Oehringen (Würtemberg), CHRIST was born in 1739 and studied for the Church. His inclinations for natural science were always allowed free play, and aided him in his constant efforts to improve the fruit culture of his district.

When appointed to the living of Kronberg, near Wiesbaden, he came to a fruit country and a centre of the nursery trade. The confused nomenclature of fruits greatly needed attention, and his excellent "Vollständige Pomologie" was the outcome of his attempts to improve matters.

His classification was first published in his "Handbuch der Obstbaumzucht," and is shortly set forth below.

System of Christ.

A. Calvilles.
  (*a*) large wide core.
  (*b*) ribbed.
  (*c*) Rose Apples.
B. Reinettes.
C. Pippins.
D. Pearmains.
E. Kantapfel (ribbed Apples).
F. Flat Apples.
G. Long pointed.
H. Round.

It will be seen at once that we have here an attempt to base a system upon the Apples themselves, taking for the main classes well-known types and forming groups from them.

As an illustration of his method the Calvilles may briefly be considered. The name Calville has been known in France for many centuries, being first recorded by LE LECTIER in 1628, and being in all probability derived from the commune of Caleville, in the Department of the Eure. The two old and well-known Calvilles, Blanche and Rouge, have thus served as types around which a family was established. Taking this accepted name, CHRIST defined them more definitely as follows. For the purpose of separation three classes were proposed :—

(*a*) True Calvilles, with open core and ribs.

(*b*) False Calvilles, with wide core but no ribs.

(*c*) Rose Apples. A closely related family of the Calvilles.

In division (*a*) come such fruits as 'Calville Blanche d'Hiver,' 'Calville Blanche d'Automne' of the yellow-skinned sorts, and 'Calville Rouge d'Hiver' in the red varieties.

In division (*b*) or False Calvilles are such as the 'Calville d'Automne Rayée' and 'Rote Flaschen Apfel.'

In the third division (*c*) of Rose Apples CHRIST established a new order which by later authors has been elevated to a separate class. In this division come fruits with red skins, a light bloom, and tender flesh, which is generally tinged with red. Examples are 'Red Astrachan,' and 'Duchess of Oldenburg.'

The next group, the Reinettes, has a history even older than the Calvilles, as the name has been used in France since 1540 at least, and is probably a diminutive of Reine, as in our Queening.

The oldest Reinette known is probably 'Reinette Sauvage,' a cider Apple known in Normandy in the fourteenth century. 'Reinette Franche' is of an age hardly if any less, and seems to have been the first fruit of size which has the true Reinette character.

The Reinettes are an extremely important class, and most probably form a real genetic division. According to KOCH they derive from *Malus dasycarpa*, and their notable characters are the texture of the flesh, the dark green leaves, very woolly beneath, and the habit of shrivelling when over-ripe. 'Ribston Pippin' is a typical example.

As CHRIST himself observes, one can say at once whether an Apple is a Reinette or not, but at the same time it is extremely difficult to formulate an exact definition. By the recognition, however, of this most important class of Apples CHRIST did great service, and all later attempts at a natural system have followed his lead in this respect. He did not, however, subdivide this class, and it was reserved for later authors to make this useful grouping.

Of his next class, the Pippins, it is not possible to speak in such high terms, as it is difficult to separate many of them from the Reinettes, and the same may be said of the Pearmains, but it was at least an attempt to continue his method of working from natural groups.

FIG. 111.—W. L. MANGER, ONE OF THE FIRST TO DEVISE A SYSTEM OF APPLE CLASSIFICATION.

[To face p. 448.

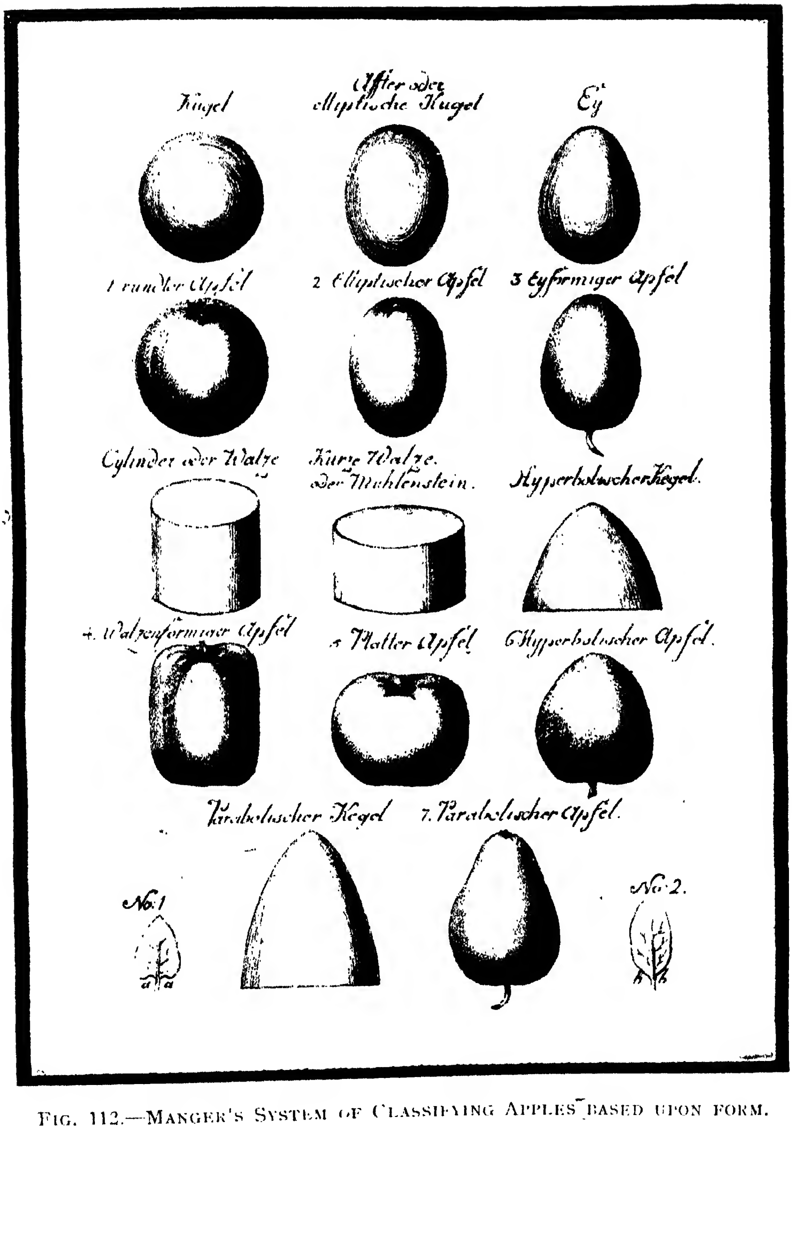


FIG. 112.—MANGER'S SYSTEM OF CLASSIFYING APPLES BASED UPON FORM.

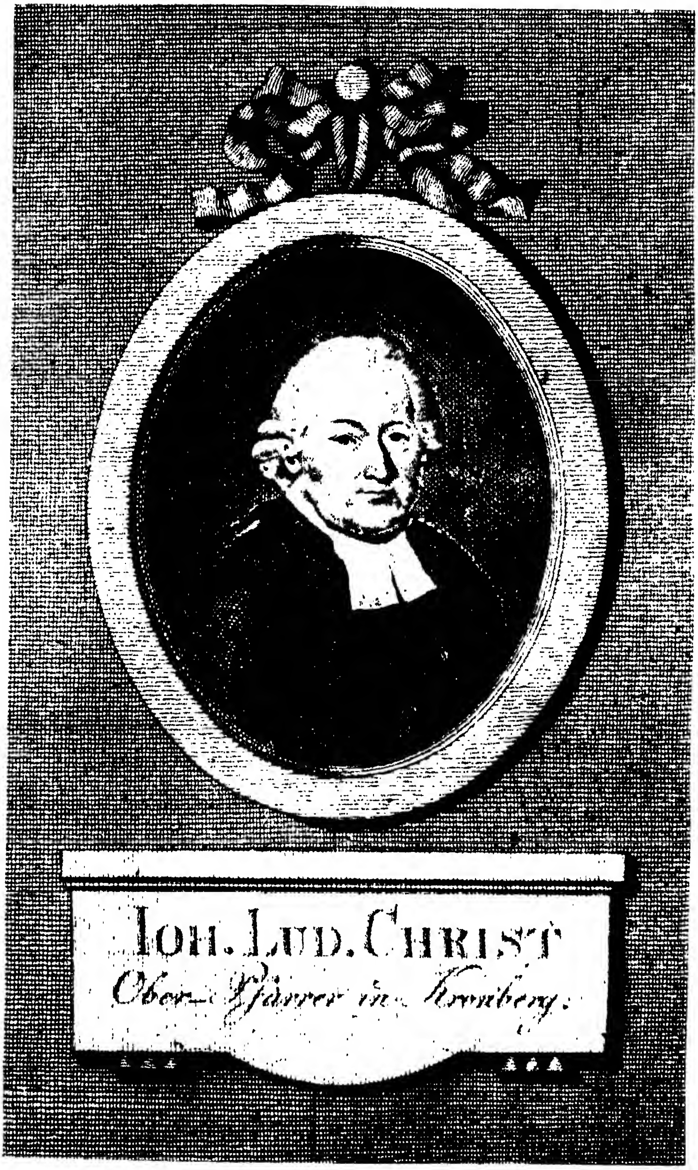


FIG. 113. J. L. CHRIST.

Geheimerath Dr. A. F. A. Diel.

zu Dietz a. L.

Fig. 114.—Dr. A. F. A. Diel.

[*To face p.* 449.

His further classes, Ribbed, Flat, Long Pointed and Round Apples, are an obvious reversion to an artificial system, and some of these useful but unscientific pigeon-holes have never been abolished, so valuable are they for the bestowal of the "unclassified and late."

This system was soon overshadowed by the masterly work of DIEL (fig. 114), who in 1799 published the first volume of his "Versuch einer Systematische Beschreibung in vorhandenen Kernobstsorten."

Dr. A. F. A. DIEL was well fitted by education to undertake so vast a work. The son of a chemist, he received a University education and became a Doctor of Medicine in 1780.

His knowledge of languages was good, and enabled him to correspond with the famous pomologists of the day in various countries.

An appointment as physician at the fashionable watering-place of Ems brought him into touch with many notable people, and he soon attained a high position in his profession.

Having always been interested in fruit-growing, he started a large nursery in which he gathered together an extraordinary collection of fruit-trees, the study of which resulted in his classic work. Though published in yearly volumes from 1799 to 1832, he had worked out his scheme of classification in advance, and it is described at length in the first volume. It is DIEL's special merit that he considered the fruit as a whole, not relying, as did so many of his predecessors, upon external characters only. He thus made a great advance towards a natural system.

Outline of Diel's System.

CLASS I. Ribbed.

1.	2.	3.
Calvilles.	Schlotter Apfels.	Gulderlings.

CLASS II. Rose Apples.

1.	2.
Tapering or Oblong.	Round or flat.

CLASS III. Rambours.

1.	2.
Wide cells.	Narrow cells.

CLASS IV Reinettes.

1.	2.	3.	4.
Self-coloured.	Red.	Grey.	Golden.

CLASS V. Striped.

1.	2.	3.	4.
Flat.	Tapering.	Oblong.	Round.

CLASS VI. Tapering.

1.	2.
Oblong conical.	Tapering.

CLASS VII. Flat.

1.	2.
True flat.	Round flat.

As will be seen from the above outline, DIEL owed much to CHRIST and adopted many of his groups.

The first class of Ribbed Apples contains all those fruits which have prominent ribs around the eye and extending round the fruit. The first order of true Calvilles corresponds to CHRIST's division (*a*), and contains such fruits as 'Lord Grosvenor,' 'Calville Blanche d'Hiver,' and in the Striped Calvilles 'Gravenstein.'

The second order of *Schlotter* or rattling Apples would contain 'Keswick Codlin,' 'Lord Suffield,' and 'Golden Spire.' This is a new division and is named from the rattling of the pips in the large cores, a character, however, by no means common to all the varieties included in this division. The third order of *Gulderling* contains the so-called False Calvilles, of which the 'Yellow Belleflower' is a well-known example. The apples of this group have not the balsamic flavour of the true Calvilles, and the flesh approaches the Reinette character.

The second class of Rose Apples is based on CHRIST's order (*c*) of the Calvilles, and would include such varieties as 'Red Astrachan,' 'Duchess of Oldenburg,' and among the yellow sorts 'White Astrachan' and 'Transparent de Croncels.'

The Rambours of Class 3 are a new division in which he has followed CHRIST in adopting a French class name. The word Rambour is first met with in the "Natura Stirpium" of RUELLIUS, published in 1535, and it is also to be found in many of the sixteenth-century Herbals and also in the "Théâtre d'Agriculture" of OLIVIER DE SERRES.

It seems first to have been applied to an Apple grown in the neighbourhood of Amiens. It is interesting to note in parenthesis that while no French pomologist has published a Classification of Apples there has always been a tendency in that country to use the name of a distinct variety generically. Rambour as denoting shape and Reinette for distinct quality of flesh have, for example, become used for all fruits which resemble the original Rambour and Reinette, following a process well known in botanical history.

Of the Rambour class we may cite 'Warner's King' and 'Rambour Franc.'

In adopting from CHRIST the class of Reinettes DIEL made an excellent division, which was later on to be much extended.

He divided them into four classes; *Self-coloured*, as 'Old Golden Pippin,' 'Summer Golden Pippin'; *red*, such as 'Cox's Orange,' 'Mother,' and 'Margil'; *grey*, 'Cockle's Pippin,' 'Norman's Pippin'; and *gold*, of which the 'Golden Reinette' and our 'King of the Pippins' may stand as types.

Having proceeded so far, DIEL evidently found that the Natural system would carry him no farther, and he therefore used shape and colouring as the basis of his last three groups. Examples of these classes will readily occur.

It will be seen that DIEL made considerable advances upon the system of CHRIST, and his system held the field for many years.

A full translation, with but few mistakes, may be found in Hogg's "The Apple and its Varieties."

It is perhaps necessary to add that the Apples named above as examples are not in many cases those described by DIEL, but are modern varieties which are more likely to be known than the old German sorts which DIEL studied.

The next great figure in pomology was EDWARD LUCAS, who was born at Erfurt in 1816, his father being a physician.

A keen botanist from early days, young LUCAS studied at the Botanic Garden and University of Munich. Passing thence to a small botanic garden at Regensburg, he acquired some fame as a botanist and was appointed later as an instructor at the School of Horticulture at Hohenheim.

It was, however, at the School of Pomology which he instituted at Reutlingen in 1869 that his real pomological work began. This establishment soon acquired an international fame, and a large number of students passed through its curriculum.

LUCAS' contribution to Systematic Pomology consisted in an enlargement of DIEL'S system, as the following table shows :—

Outline of the Diel-Lucas System.

CLASSES.
1. Calvilles.
2. Schlotters.
3. Gulderlings.
4. Rosenapfels.
5. Taubenapfels.*
6. Rambours.
7. Rambour Reinettes.*
8. Borsdorfer Reinettes.*
9. One-coloured Reinettes.*
10. Red Reinettes.*
11. Gold Reinettes.*
12. Grey Reinettes.*
13. Striped Apples.*
14. Pointed Apples.
15. Flat Apples.

The new classes which LUCAS added are marked by a star, and it will be evident at once that these are natural ones based upon marked types of Apples. Class 5, the Tauben Apples or Dove Apples, was another case where a popular variety gave its name to a class. The Dove Apples are those whose curious blue-red colour, caused by a light bloom overlaying a dull red, is supposed to resemble the breast of a dove. The same idea had evidently occurred in France, where so far back as 1667 MERLET described a 'Pomme Pigeon.' This class is not, I think, represented by any well-known English fruits, but the 'Blue Pearmain' would, when on the tree, give a good idea of the colouring suggested.

In Class 7, the Rambour Reinettes, we again have a new division which is valuable, and contains those large unequal-sided Apples of the Rambour shape but with the flesh of the Reinettes. 'Roundway Magnum Bonum' is a good example.

In Class 8 the well-known 'Borsdorfer' serves as a type.

In the treatment of the Reinettes LUCAS expands DIEL'S orders of Gold, Red, Grey, and Self-coloured into classes, and they and the remaining classes follow closely DIEL'S original suggestion.

So far we have dealt with the main classes only, but it was LUCAS's merit to establish three excellent divisions for the orders. These were Pale or Blushed Fruits, Striped, and Whole-coloured Fruits. It will be seen at once that these are good and constant characters, and in later authors' hands they have been given an important place. As the system of DIEL-LUCAS has not been translated into English, the most recent presentation of it by Dr. ENGELBRECHT is appended (p. 457), with a typical English fruit in each class and order where possible. The true test of a system is of course its capacity to bring together closely-related varieties, and, judged by this criterion, it cannot be said that the DIEL-LUCAS system is altogether satisfactory. We find, for instance, in the same group 'Worcester Pearmain' and 'Margil,' two fruits which are not at all likely to be confused; and the same may be said of 'Stirling Castle' and 'Peasgood's Nonesuch,' which are also placed in juxtaposition. It is evident that this system is based too much upon form, and the character of the flesh is insufficiently considered. The DIEL-LUCAS system remains, however, at the present time the only one which is used to any considerable extent.

Another writer who built upon DIEL was FRIEDRICH J. DOCHNAHL, author of that wonderful *multum in parvo* "Die sichere Führer in der Obstkunde." This attempt is the most elaborate yet proposed, and is an effort to base the division upon natural species of *Malus* from which cultivated Apples have been derived. DOCHNAHL also took notice for the first time of vegetative characters as well as the fruits, and it will be readily understood that this makes it difficult to put any condensed account on paper. As the classification was founded, as has been said, upon the botanical species, we find the so-called Crabs and the dwarf Paradise Apples included in the scheme, which may be shortly illustrated as below.

It will be seen from the above table that DOCHNAHL bases his early divisions upon the distinct species of *Pyrus Malus* and his two main tribes, being those supposedly descended from *P. M. glabra* Koch (Weinlings and Markapfels), and from *P. M. tomentosa* for the Calvilles and following classes numbered 3 to 10.

Such a classification, excellent as it is in many respects, suffers from the difficulty that it is not always possible to study tree characters with the fruits in hand, and it is very probably due to this reason that DOCHNAHL's system, in so many ways an improvement upon that of DIEL-LUCAS, has not supplanted it.

In the further subdivisions DOCHNAHL did not adhere to a fixed plan for each. In the Weinlings, for instance, the calyx and pistil are taken into account. In the Calvilles the persistence of the stipules divides a section, as does also the colour of the leaves, and in some cases the presence or absence of fertile or infertile seeds. In the adoption of pale or blushed fruits, striped or coloured fruits, he follows LUCAS, as did most of his successors. The system of DOCHNAHL is extremely suggestive to the student, but for practical use in naming fruits it must be considered too elaborate. It must be added that the

Dochnahl's System.

EDIBLE FRUIT.	TREE APPLES	LEAF SMOOTH. CRAB APPLES (*P.M. glabra*).			Fruit sweet, sour or wine-sourish, without aroma	1. WEINLING.
					Fruit sweet or wine-sourish, more or less spicy	2. MARKAPFEL.
		LEAF HAIRY. From *P.M. tomentosa*.	Ribbed. Core open.	Aromatic.	Fruit regularly ribbed, not clearly striped, flesh white	3. CALVILLES.
					Fruit ribbed at eye, unequally arched, flesh firm	4. GULDERLING.
				Not aromatic.	Fruit irregular or lightly ribbed, not small, flesh granular, loose	5. SCHLOTTER.
					Fruit large, broader than high, one-sided, boldly ribbed, flesh coarse granular	6. RAMBOUR.
			Round. Core closed.	Aromatic.	Fruit small or middle-sized, evenly formed, flesh white and loose	7. ROSENAPFEL.
					Fruit roughly spotted, more or less russeted, readily shrivelling, flesh crisp	8. REINETTE.
				Not aromatic.	Fruit not shrivelling, always more or less striped, ripening about September	9. STREIFLINGE.
					Fruit never striped, ground coloured or only blushed	10. TROSSAPFEL.
	DWARF APPLES	From *Pyrus Malus paradisiaca*.			Fruit sour, insipid	11. JOHANNISAPFEL (PARADISE).
					Fruit sour, sometimes slightly sweet	12. HECKAPFEL.
INEDIBLE FRUIT.	CHERRY APPLES. Derived from: *P.M. baccata*. *P.M. prunifolia*. *P.M. spectabilis*.				Fruit calyculate, leaf woolly	13. BRUSTAPFEL.
					Fruit calyculate, leaf smooth	14. KRONAPFEL.
					Fruit without calyx, leaf smooth	15. KIRSCHAPFEL.

translation as given in HOGG'S "The Apple and its Varieties" is of an early attempt, and his final edition is as given above. No English translation of the latter has so far been made, as far as I am aware.

It will have been noticed that so far all the systems reviewed have been those of Continental authors, and it now remains to consider those of British and American authors.

The only American proposal so far made is that of Dr. JOHN WARDER, who published it in his "American Pomology," 1867, the volume on Apples being the only one which appeared. This system is of great simplicity, as will be seen from the table below:—

Warder's System.

CLASS.	ORDER.	SECTION.	SUBSECTION.
Flat	Regular	Sweet	Self-coloured Striped Russet
		Sour	Self Striped Russet
	Irregular	Sweet	Self Striped Russet
		Sour	Self Striped Russet
Conical	Regular	Sweet	Self Striped Russet
		Sour	Self Striped Russet
	Irregular	Sweet	Self Striped Russet
		Sour	Self Striped Russet
Round	Regular	Sweet	Self Striped Russet
		Sour	Self Striped Russet
	Irregular	Sweet	Self Striped Russet
		Sour	Self Striped Russet
Oblong	Regular	Sweet	Self Striped Russet
		Sour	Self Striped Russet
	Irregular	Sweet	Self Striped Russet
		Sour	Self Striped Russet

This proposal is in striking contrast to the elaborate system of DOCHNAHL. The classes need no explanation. The orders are based on the appearance of a vertical section, a regular fruit being without

ribs and an irregular one having ribs or flattened sides, thus departing from a regular circle. The sections "sweet" and "sour" would often be difficult to separate in practice, but they correspond to a real distinction, the cooking and dessert fruit of these days. In the final subsections WARDER adopted LUCAS with a difference: placing whole-coloured fruits in No. 1, and russet fruits in No. 3. This is not an improvement, as russeting is a very variable character, whereas the original divisions of LUCAS are constant and reliable. WARDER'S suggestion has never been expanded by later pomologists, and it remains but a step in history.

The next attempts were those of Dr. ROBERT HOGG, and they have the distinction of being the only ones made by a British authority. The first was published in the "Apple and Pear" in 1851. This resembles WARDER'S in the importance given to form, but has a striking new departure in the divisions Summer, Autumn, and Winter.

Hogg's System of 1851.

CLASS I. Summer Apples, those ripening on the tree.

Order 1.	*Order 2.*
Round, roundish or oblate.	Oblong, conical, oval or ovate.
A. Pale.	A. Pale.
B. Striped.	B. Striped.
C. Red.	C. Red.

CLASS II. Autumn Apples.

Including such as are in use from the time of gathering till Christmas. Orders and divisions as Class I. with D. *Russet* added.

CLASS III.

Including such as are in use during the whole winter and spring. Orders and divisions as Class II.

This arrangement is quite useful in a rough way, but of course takes no account of the very important characters of the flesh and is therefore of a limited utility.

The next proposal made by HOGG was an elaborate artificial system based on the relative positions of the stamens, shape of the tube, cells, &c. This was first published at length in the fifth edition of the "Fruit Manual" in 1885.

An Outline of Hogg's Artificial System.

STAMENS.	TUBE.	CELLS.	CELLS.
Marginal	Conical	Round	Axile Abaxile.
		Ovate	Axile. Abaxile.
		Obovate	Axile. Abaxile.
		Elliptical	Axile. Abaxile.
	Funnel-shaped	Round	Axile. Abaxile.
		Ovate	Axile. Abaxile.
		Obovate	Axile. Abaxile.
		Elliptical	Axile. Abaxile.

Stamens Median and Basal are grouped in the same manner.

The weakness of this system is the choice of the stamens for the first divisions. This character is one difficult to see with the naked eye, and one very likely to vary with any slight malformation of the fruit. It is quite evident from a study of the "Fruit Manual" that HOGG did not sufficiently realize the need of examining a large number of fruits in forming his descriptions, and one must suspect that in many cases his fruits were referred to their classes from the examination of a single specimen.

The same remarks apply to the choice of his second division, that of the Tube, as the difference between a conical and a funnel shape is often a very fine point, and also likely to be very materially altered in an extra-sized specimen. These two characters, taking so important a position, render the likelihood of going astray very probable. As an example of an artificial system no better could be found, and such an attempt can only be justified by its success.

The Sexual system of Linnaeus is the classic example of a workable artificial arrangement, which, although it gives no guide as to relationship, forms a handy means of running down an unrecognized plant. HOGG doubtless sought to do the same for Apples, but it must be confessed that in this he failed, as since his day no pomologist has adopted or amplified his suggestion. For full details the reader is referred to the fifth edition of the "Fruit Manual" as quoted above.

Having thus briefly recorded the various attempts which have been made to classify Apples, it remains to sum up their general tendency.

A steady progress towards a natural system, beginning in the work of CHRIST and developing through DIEL, DOCHNAHL, and LUCAS, is the main feature brought out by this survey. In the writer's opinion further progress can only be made in this direction. Several main classes or general divisions can be at once distinguished; the Reinettes, the Codlins, and the Russets are obvious examples. The task of subdividing these and other classes does not seem impossible, and in so doing a great aid in the identification of varieties would be afforded.

While the authoritative naming of Apples will doubtless always remain in the hands of experts, as in other natural sciences, such grouping is extremely desirable and would be instructive to students, who would be able to take certain type fruits and from them form some conception of varieties which they may not have the opportunity of seeing. For these reasons the writer thinks such a system worth making, and hopes that some leisured enthusiast may be found to attempt it.

APPENDIX

THE DIEL-LUCAS SYSTEM AS REVISED BY DR. ENGELBRECHT.

Class I. Calvilles.

Fruit mostly middle-sized, about 60 to 80 mm. broad. Ribs run over the fruit from eye to stem. Skin mostly smooth, often greasy, never russet. Dots but slightly conspicuous. Core large. Cells mostly large and open, always clearly abaxile. Flesh fine or moderately fine in grain, spongy or loose, very juicy. Flavour marked, often good, according to Diel balsamic, spiced, juicy and sweet, sometimes a little sour.

ORDER I. Pale Calvilles.

1. Fruit much broader than high, round or conical flattened; greatest diameter at the centre of the fruit; halves nearly equal.
   Example : 'Lord Grosvenor.'
2. Fruit much broader than high, widest at the base.
   Example : 'Calville Blanche d'Hiver.'
3. Fruit not, or but little, broader than high, flattened oval, egg, or barrel-shaped.
   Example : 'Calville St. Sauveur.'

ORDER II. Striped Calvilles.

The sunny side is generally lightly or markedly striped with red, other characters as Order I.

1. Fruit much broader than high, flat-round.
   Example : 'Striped Winter Calville.'
2. Fruit markedly broader than high, flat-round or egg-shaped, equally rounded at eye and stem.
   Example : 'Gravenstein.'
3. Fruit somewhat broader than high, somewhat egg-shaped, markedly tapering to stem.
   Example : 'Calville Aromatique.'
4. Fruit about as broad as high, mostly broader at the base, conical or egg-shaped.
   Example : 'Cornish Gilliflower.'

ORDER III. Red Calvilles.

The skin is red, especially on the sunny side, not striped or but faintly.

1. Fruit round, widest at the centre.
   Example : 'Schwarzrother Winter Calville.'
2. Fruit markedly broader than high, round or round-conical, generally broadest at the base.
   A. Tube conical or not clearly funnel-shaped.
   Example : 'Calville Rouge d'Automne.'
   B. Tube funnel-shaped.
   Example : 'Calville Rouge d'Hiver.'
3. Breadth and height about equal, markedly broadest at the base, conical or egg-shaped.
   Example : 'Aesopus Spitzenberg.'

Class II. Schlotter Apples.

Fruits middle-sized or large, about 60 to 80 mm. broad or a little broader. Ribs extend over the fruit, often shallow and unequal. Halves often unequal. Skin smooth, scarcely ever greasy. Core large. Cells large, a little oval, often split, opening wide, markedly abaxile. Seeds rattling. Flesh coarse and loose, without aroma.

ORDER I. Pale Schlotter Apples.

1. Fruit markedly broader than high.
   Examples : 'Keswick Codlin,' 'Lord Suffield.'
2. Fruit higher than broad.
   Examples : 'Mancks Codlin,' 'Golden Spire.'

ORDER II. Striped Schlotter Apples.

The fruit is brightly striped, sometimes deeply red-striped.

1. Fruit broader than high.
   Example: 'Suisse' (Leroy).
2. Breadth and height nearly equal, often higher than broad.
   (*a*) Eye open or half open, or not quite closed.
   Example: 'Prinzen Apple.'
   (*b*) Eye entirely closed.
   Example: 'Rheinische Schafsnase.'

ORDER III. Red Schlotter Apples.

The skin is red on the sunny side, slightly striped or not at all.

1. Somewhat broader than high.
   Example: 'Postophe d'Hiver.'
2. Breadth and height equal, or rather taller than high.
   Example: 'Okera.'

CLASS III. GULDERLINGS.

Fruit mostly middle-sized, sometimes a little larger, seldom smaller. Strongly marked ribs around the eye, not running over the fruit or only very shallow if so. Halves slightly unequal. Skin smooth, often with trace of russet. Core middle-sized, slightly torn, mostly nearly open. Flesh fine-grained, often firm, occasionally somewhat loose. Flavour generally spicy, but never balsamic or of the Rose Apple or Reinette flavour, sometimes a little winey and sweet.

ORDER I. Pale Gulderlings.

Skin pale or very slightly red.

1. Fruit broader than high, flattened round, widest at the centre.
   (*a*) Eye open or half open.
   Example: 'London Pippin.'
   (*b*) Eye closed.
   Example: 'Reinette de Cantorbéry.'
2. Fruit markedly broader than high, mostly round, egg-shaped, or flat conical.
   Example: 'Tower of Glamis.'
3. Fruit nearly as high or sometimes higher than broad.
   Example: 'Yellow Belleflower.'

ORDER II. Striped Gulderlings.

Abundantly striped on the sunny side.

1. Markedly broader than high.
   Example: 'Swedish Winter Postoph.'
2. Nearly as high as broad.
   Example: 'Forge.'

ORDER III. Red Gulderlings.

Fruit markedly red, occasionally a little striped.

1. Fruit markedly broader than high.
   Example: 'Greenup's Pippin.'
2. Fruit about as high as broad.
   Example: 'Red Gulderling.'

CLASS IV. ROSE APPLES.

Fruit mostly middle-sized, sometimes small, seldom large. Ribs about the eye are rather small, decreasing towards the stem. Skin smooth with bloom upon the tree, moderately shining. Dots small. Seldom russeted. Halves equal. Core mostly large, cells not very wide open. Flesh fine-grained or moderately so, tender, mellow, and very spongy. Flavour markedly spiced. Strawberry taste.

ORDER I. Pale Rose Apples.

The skin is pale or only slightly blushed.

1. Fruit much broader than high, flattened round; greatest diameter at centre of fruit or a little below.
   Example: 'Marzipan Reinette.'

2. Markedly broader than high, flattened round conical.
Example : 'Transparent de Croncels.'
3. Fruit nearly as high as or slightly higher than broad.
Example : 'Antonowka.'

ORDER II. Striped Rose Apples.

The skin on the sunny side marked and striped with red.
1. Much broader than high, flattened round or strongly flattened, often broadest at the centre.
(*a*) Eye half or entirely open.
Example : 'Caroline Augusta' (Leroy).
(*b*) Eye closed.
Example : 'Hoary Morning.'
2. Fruit markedly broader than high, round or flat round.
(*a*) Eye open or half open.
Example : 'Rabau d'Été' (Leroy).
(*b*) Eye closed.
Example : 'Duchess of Oldenburg.'

ORDER III. Red Rose Apples.

Fruit red, more or less striped.
Fruit broader than high, flattened round.
(*a*) Eye open or half open.
Example : 'Rose de Tyrol' (Leroy).
b) Eye closed or very little open.
Example : 'Irish Peach.'
2. Fruit broader than high, flattened round or flat conical.
Example : 'Red Astrachan.'
3. Fruit about as high as broad.
Example : 'Williams' Favourite.'

CLASS V. DOVE OR PIGEON APPLES.

Fruit middle-sized or small; as high as broad, or a little higher. Egg-shaped, conical, cylindrical. Ribs slight around the eye, disappearing towards the middle. Skin smooth, shining. Dots small. Rarely russeted. Flesh fine at first, becoming tender. Nearly always with a highly-spiced flavour.

ORDER I. Pale Dove Apples.

1. Fruit not red or shows only a slight flush.
(*a*) Eye open or half open.
Example : 'Romarin Blanc.'
(*b*) Eye closed. 'Pigeonnet.'

ORDER II. Striped Dove Apples.

1. Fruit more or less clearly striped.
(*a*) Eye open or half open.
Example : 'Pigeon de Kunze.'
(*b*) Eye closed.
Example : 'Pigeonnet Blanc d'Hiver.'

ORDER III. Red Dove Apples.

Fruit red or slightly red, not often striped.
Example : 'Pigeonnet Anglais.'

CLASS VI. RAMBOURS.

Fruit seldom middle-sized, mostly large, about 80 mm. broad, frequently very large. Ribs large, unequal, running over the fruit. Halves always markedly nuequal. Skin moderately rough, frequently russeted. Flesh coarse or half fine, somewhat loose, not, or only very slightly, spiced.

ORDER I. Pale Rambours.

Fruit pale, only slightly blushed.
1. Fruit much broader than high, flattened round.
(*a*) Eye open or half open.
Example : 'Ecklinville.'

(*b*) Eye closed or only slightly open.
Example: 'Warner's King.'

2. Fruit markedly broader than high, flat conical or flat round.
Example: 'Alfriston.'

ORDER II. Striped Rambours.

The fruit is red, on sunny side clearly striped.

1. Fruit markedly broader than high, flattened round, slightly broadest at the base.
Example: 'Yorkshire Greening.'
2. Fruit markedly broader than high, somewhat broadest at the base, mostly flat-conical or flattened round.
(*a*) Eye open or half open.
Example: 'Cox's Pomona.'
(*b*) Eye closed or only slightly open.
Example: 'Hollandbury.'

ORDER III. Whole-coloured Rambours.

Fruit red or only occasionally striped.

1. Markedly broader than high, flattened round, broadest a little below the base.
Example: 'Flanders Pippin.'
2. Fruit slightly broader than high, flattened oval or conical shape.
(*a*) Eye open or half open.
Examples: 'Glory of the West,' 'Rambour Papaleu.'

CLASS VII. RAMBOUR REINETTES.

Fruit middle-sized or large. Ribs broad and shallow, running over the fruit. Halves markedly unequal. Skin moderately rough, abundantly russeted, with few exceptions ground coloured. Flesh fine or nearly so, often marrowy, spiced, winey and sweet. In size equal to the Rambours, in flavour resembling the Reinettes.

ORDER I. Smooth-skinned Rambour Reinettes.

The skin is smooth or varying to a russet red.

1. Fruit markedly broader than high, flattened round, greatest diameter generally just above the stem.
A. Eye open or half open.
Example: 'Swaar.'
B. Eye closed or nearly so.
Example: 'Drap d'Or.'
2. Fruit mostly broader than high, egg-shaped or flat conical, broadest at base.
(*a*) Eye open or half open.
Example: 'Bedfordshire Foundling.'
(*b*) Eye closed or slightly open.
Example: 'Yellow Newtown Pippin.'

ORDER II. Rough-skinned Rambour Reinettes.

The skin is generally fine russet, occasionally rough.

1. Fruit largest in centre, flattened round, or flat.
Example: 'Allen's Everlasting.'
2. Fruit largest at base, flattened round or round conical.
Example: 'Reinette de Canada.'

CLASS VIII. BORSDORFER REINETTES.

Fruit small or middle-sized, nearly always very symmetrically built, mostly flattened round or oblong, basin smooth or with only insignificant ribs. Transverse section round. Skin smooth, shining, abundantly covered with russet veinings and dots. Core small or medium, generally axile. Flesh very fine-grained, firm, crisp, seldom mellow, moderately juicy, of a very characteristic flavour, often very agreeably spiced, winey and sweet.

ORDER I. Pale Borsdorfer Reinettes.

The fruit is not, or only very slightly, coloured red.

1. Eye open or half open.
Example: 'Galloway Pippin.'

2. Eye closed or only slightly open.
Example : ' Reinette Thouin.

ORDER II. Striped Borsdorfer Reinettes.

The fruit is red on sunny side and darkly striped.
Example : ' Red Borsdorfer.'

ORDER III. Red Borsdorfer Reinettes.

The fruit is red on sunny side, not, or not markedly, striped.
A. Eye open or half open.
Example : ' Borsdorfer.'
B. Eye closed or nearly so.
Example : ' Red Canada.'

CLASS IX. SINGLE-COLOURED REINETTES.

Fruit small or middle-sized, mostly symmetrical. Basin even or very slightly ribbed. Transverse section round. Skin pale or only very slightly flushed, generally moderately shining. Seldom warted. Core small or middle-sized, axile or nearly so. Flesh fine-grained, at first crisp, later mellow and soft, juicy, true Reinette flavour, winey and sweet.

ORDER I. Small Pale-coloured Reinettes.

Their greatest diameter does not exceed 60 mm. when from standard trees.
1. Skin smooth.
A. Eye open or half open.
Example : ' Yellow Ingestrie.'
B. Eye closed or slightly open.
Example : ' Hughes' Golden Pippin.'
2. Skin slightly rough.
A. Eye open or half open.
Example : ' Golden Pippin.'
B. Eye closed or nearly so.
Example : ' Cockle Pippin.'

ORDER II. Middle-sized Pale-coloured Reinettes.

Greatest width 60 to 80 mm.
1. Skin smooth.
A. Fruit much broader than high, generally widest in centre of fruit. Flattened round.
(*a*) Eye open or half open.
Example : ' Reinette von Breda.'
(*b*) Eye closed or half open.
Example : ' Evagil.'
B. Fruit markedly broader than high, mostly broader at the base, flattened round or flat conical.
(*a*) Eye open or half open.
Example : ' Scott's Reinette.'
(*b*) Eye closed or slightly open.
Example : ' Green Newton Pippin.'
C. Fruit nearly as broad as high, flattened round or flat conical.
(*a*) Eye open or half open.
Example : ' Frogmore Prolific.'
(*b*) Eye closed or slightly open.
Example : ' Early Yellow Reinette [Downing].'
2. Skin covered fine russet.
A. Fruit flattened roundish; greatest diameter at centre.
(*a*) Eye open or half open.
Example : ' Wyken Pippin.'
(*b*) Eye closed or slightly open.
Example : ' Old Nonpareil.'
B. Fruit egg or conical shaped.
Example : ' Martin's Nonpareil.'

CLASS X. RED REINETTES.

Fruit middle-sized, seldom small, rarely large, generally symmetrical. Basin generally smooth, ribs very slight. Transverse section round. Skin green or greenish gold, not yellow gold; rich red on the sunny side, mostly smooth, seldom

russet, very rarely warted. Core middle-sized or small, closed or a little open. Flesh somewhat firm, later becoming mellow, juicy, winey and sweet, with Reinette flavour.

ORDER I. Striped Red Reinettes.

The skin is red on sunny side and darkly striped.

1. Fruit much broader than high, generally largest at the centre, strongly flattened round.
   - (*a*) Eye open or half open.
     Example : 'Red Holland Bellefleur.'
   - (*b*) Eye closed or a little open.
     Example : 'Baumann's Red Reinette.'
3. Fruit markedly broader than high, flattened round or round conical.
   - (*a*) Eye open or half open.
     Example : 'Stone Pippin.'
   - (*b*) Eye closed or a little open.
     Example : 'Margil.'
3. Fruit nearly as high as broad, mostly markedly widest at the stem, conical or roundish oval.
   - (*a*) Eye entirely open.
     Example : 'Reinette des Carmes.'
   - (*d*) Eye half open.
     Example : 'Scarlet Pearmain.'
   - (*c*) Eye generally entirely closed.
     Example : 'Adams' Pearmain.'

ORDER II. Whole-coloured Red Reinettes.

The skin is red and very rarely striped.

1. Fruit much broader than high, broadest at the centre, round flattened or round conical.
   - (*a*) Eye open or half open.
     Example : 'Reinette Rouge Étoilée' ['Calville Rouge Précoce'].
   - *b*) Eye half closed or a little open.
     Example : 'Baldwin Sturmer Pippin.'
   - (*c*) Eye entirely closed.
     Example : 'Bonum (Downing).'
2. Fruit markedly broader than high, flattened round or round conic, moderately wide at the centre.
   - (*a*) Eye open or half open.
     Example : 'Scarlet Nonpareil.'
   - (b) Eye closed or a little open.
     Example : 'Landsberger Reinette.'
3. Fruit mostly slightly broader than high, widest at the base, flattened conical or egg-shaped.
   - (*a*) Eye open or half open.
     Example : 'Kentish Pippin.'
   - (*b*) Eye closed or a little open.
     Example : 'Cousinotte Rouge d'Hiver.'

CLASS XI. GOLD REINETTES.

Fruit mainly middle-sized, even and regularly shaped. Basin even, seldom with any marked ribs. Skin, when fully ripe, golden yellow, slightly red on sunny side. A light russet over all the fruit. Not warted. Eye small to middle-sized, mostly closed or very slightly open. Flesh fine-grained, moderately firm, becoming mellow, juicy, with high Reinette flavour, winey and sweet.

ORDER I. Striped Gold Reinettes.

The skin is lightly striped on the sunny side.

1. Fruit much broader than high, flattened round, widest at the centre or a little below.
   - (*a*) Eye open or wide open.
     Example : 'Peasgood's Nonesuch.'
   - (*b*) Eye half open.
     Example : 'Cox's Orange Pippin.'
   - (*c*) Eye closed or a little open.
     Example : 'Annie Elizabeth.'

2. Fruit broader than high, roundish conical or egg-shaped, mostly widest at the base.
   Example : 'King of the Pippins' (of the present day).
   (*b*) Eye half open or nearly open.
   Example : 'Mannington Pearmain.'
   (*c*) Eye closed or only slightly open.
   Example : 'Mabbott's Pearmain.'

ORDER II. Red Golden Reinettes.

The skin is largely covered with red, not markedly striped.
1. Fruit much broader than high, flattened round.
   Example : 'Court Pendu Plat.'
2. Fruit somewhat broader than high, flattened round or oval.
   (*a*) Eye open.
   Example : 'Golden Harvey.'
   (*b*) Eye closed or half open.
   Example : 'Heusgen's Golden Reinette.'

Class XII. Grey Reinettes.

Fruit small or middle-sized, evenly shaped. Basin even, without any marked ribs. Skin, especially in the larger fruits, covered with light russet. Core small or middle-sized, closed or slightly open. Flesh fine, tender, and sometimes almost spongy. Flavour always very good, spicy and sweet.

ORDER I. Pale Grey Reinettes.

The skin is pale, and only very exceptionally lightly washed with red.
1. Fruit markedly broader than high, flattened round or flat-conical, mostly largest, at the centre.
   (*a*) Eye open or half open.
   Example : 'Syke House Russet.'
   (*b*) Eye closed or a little open.
   Example : 'Brownlee's Russet.'
2. Fruit mostly broader than high, largest at base, round-conical or egg-shaped.
   (*a*) Eye open or half open.
   Example : 'Forfar Pippin.'
   (*b*) Eye closed or a little open.
   Example : 'Bullock's Pippin.'

ORDER II. Striped Grey Reinettes.

The fruit is clearly and darkly striped and partly covered with russet.
Example : 'Belle de Boskoop.'

ORDER III. Red Grey Reinettes.

Skin on sunny side only slightly red, and the russet not always covering the whole fruit.
1. Fruit flattened round, generally widest at centre.
   Example : 'Reinette Grise de Canada.'
2. Fruit round, or round conical, widest at the base.
   Example : 'Royal Russet.'

Class XIII. Striped Apples.

Fruit mostly middle-sized, seldom large. Basin smooth or with faint ribs. Skin smooth markedly red on the sunny side, always markedly striped. Core small or middle-sized, closed or a little open. Flesh firm or half firm, not, or but little, spiced or sweet—occasionally sour. Mostly culinary fruit.

ORDER I. Even-striped Apples.

Eye even, without ribs in nearly all cases.
1. Fruit mostly widest in centre, flattened round.
(*a*) Eye open or half open.
   Example : 'Ashmead's Kernel' (probably an error).
(*b*) Eye closed or a little open.
   Example : 'Princesse Noble des Chartreux.'

3. Fruit mostly markedly largest in the centre, roundish-conical or egg-shaped, rarely round oval.
   (*a*) Eye open or half open, or at least not entirely closed.
   Example : 'Cellini.'
   (*b*) Eye closed.
   Example : 'Eiser Rouge.'

ORDER II. Ribbed Striped Apples.

From the eye to the middle of the fruit the ribs are marked, and the shape of the fruit is rendered uneven.

1. Fruit widest at the centre or slightly below, flattened round.
   (*a*) Eye open or half open.
   Example : 'Pomme de Bohémien' (Leroy).
   b) Eye closed or a little open.
   Example : 'Pomme Rayée d'Hiver' (Leroy).
2. Fruit markedly widest at the base, round conical or egg-shaped.
   Example : 'Kirschmesser.'

CLASS XIV. POINTED APPLES.

Fruit middle-sized, widest at the base, conical or egg-shaped. Basin even or but slightly ribbed, rarely running to centre of fruit. Skin smooth, seldom russet, pale or red, not striped. Core small to middle-sized, closed or slightly open. Flesh fine or fairly so, not spiced, winey, or sweet.

ORDER I. Pale Pointed Apples.

Skin pale, or but slightly red washed.
(*a*) Eye open or half open.
Example : 'Mme. Hayez.'
(*b*) Eye closed or slightly open.
Example : 'Transparent de Zurich.'

ORDER II. Red Pointed Apples.

The skin is lightly red on sunny side. Only exceptionally striped.
(*a*) Eye open or half open.
Example : 'Bonne de Mai.'
(*b*) Eye closed or a little open.
Example : 'Muller's Spitzapfel.'

CLASS XV. FLAT APPLES.

Fruit middle-sized, seldom large or small, mostly widest at the base, flattened round, but exceptionally very flat and flat conical. Basin even, or with but slight ribs. Skin smooth, seldom russet, ground or whole coloured, but rarely striped. Core small, closed or slightly open. Flesh fine-grained. Flavour seldom spicy or sweet.

ORDER I. Pale Flat Apples.

Fruit pale, with occasional slight flush.
(*a*) Eye open or half open.
Example : 'Wellington.'
(*b*) Eye closed or a little open.
Example : 'Hawthornden.'

ORDER II. Red Flat Apples.

The fruit is markedly red on sunny side.
(*a*) Eye open or half open, seldom closed.
Example : 'Norfolk Bearer.'
(*b*) Eye closed or a little open.
Example : 'Lady Apple.'

DEGENERATION OF POTATOS.

By H. T. GÜSSOW, Dominion Botanist, Dominion of Canada.

THE question of "degeneration" in potatos is one that has attracted the attention of practical growers for a great number of years. From the frequent discussions of the subject I consider it reasonable to assume that a belief in the "degeneration of potatos" is almost an article of the farmer's creed. Quite frequently poor crop yields, susceptibility to disease, and other failure effects are excused as being due to "degeneration," "running out," "lack of vigour," &c.; these latter phrases, be it noted, being merely circumlocutions for an idea implied in the term "degeneration."

Though this concept of the word is correctly deduced by the practical grower, and even potato breeder, the usage of the term itself appears to, and does actually, involve a fatal misconception of the true inwardness of the term. Hereditary degeneration, *i.e.* a decline in the progeny due to pre-existent weakness of the parents, is well known, and many examples might be quoted from both the animal and plant kingdoms. In this phrase we imply parentage, and reflect upon the parents either male or female, or both. Let us then use a term which I am not aware has hitherto been employed, *viz.* chromosomatic degeneration, as opposed to somatic deterioration, to which I shall presently refer.

Chromosomatic degeneration, or degeneration pure and simple, as we conceive it, is the manifestation of a certain failing or decline transmitted from parents to offspring and perpetuated throughout subsequent generations, or even handed down in intensified ratio to them, until the stock becomes so markedly enfeebled that sterility or death puts an end to the line. This effect is due to the transmission of heritable degenerate characters by means of the chromosomes of the parents. These chromosomes are the small bodies in the male and female germ cells, which conjugate in sexual reproduction, and they may be regarded as the "vehicles" of latent or dominant characters both of the male and of the female parents. One example may suffice to interpret to the lay mind the bearing of this somewhat technical exposition. Alcoholism, especially in both parents, will invariably show up detrimentally in the children, and they, being likewise so afflicted, will in turn give rise to mentally and physically feeble progeny. The degenerative taint has been transmitted by the chromosomes of the parents.

Let us, therefore, clearly understand that degeneration is a term which should properly be employed only where sexual reproduction

plays a part; hence our use of the qualitative epithet chromosomatic, in order to define accurately the meaning of the loosely used word degeneration.

Now does sexual reproduction enter into the commercial growing of potatos? No. People who claim that "degeneration" takes place in potatos clearly confuse the proper significance of the term. Potato varieties originate in the first instance by sexual reproduction. A new variety of potato can only result from the true seed, and from this seed the new variety is grown initially. Subsequently the tubers are vegetatively multiplied and perpetuated by their use as seed potatos for planting. This vegetative mode of reproduction is essentially identical with the methods of raising plants from cuttings, or of perpetuating hyacinths or tulips, for instance, by means of bulbs, apple varieties through grafts, or roses by budding. When the breeder has raised his new variety, and considers it worthy of perpetuation, it has passed through a long series of improvements and selections, and is, *ex hypothesi*, superior at the start to the parents from which it is derived.

The questions which now require to be solved are these:—Do these varieties deteriorate, and, if they do, how does deterioration show, and can it be remedied?

A plant almost exclusively reproduced by vegetative means should not deteriorate; one cutting, one single tuber is just as good, or just as bad, as the plant from which it was taken. A thousand tubers from the same stock should grow in the same way as did the initial parent plant. Here a passing mention must be made of mutation, or the sudden change in some characteristic of an offspring from the corresponding feature in the parent—a phenomenon which has been observed in a number of instances. But the only instance known to us —LABERGERIE'S "famous" mutation of a white variety into a variety known as 'Blue Giant,' or something very similar—is not by any means authentic enough to be taken into serious consideration here.

In so far as chromosomatic degeneration of potatos is concerned, we know of no single instance, nor have we found any literature that contains authentic or valuable evidence in support of such a claim. Indeed, one plant breeder of world-wide fame, Professor FRUWIRTH of Vienna, expresses a view of the subject which clearly supports our own conception. He says:—"True degeneration of a variety, which would manifest itself under uniformly favourable conditions, and when superior seed potatos are used, has not been proven, and is improbable." *

This author cautiously refers to the use of superior seed potatos, which should be grown under uniformly suitable conditions. "Evidently, then, there is a 'degeneration'"—some adherents of the doctrine of "degeneration" will exclaim—"if one does not use

* "Ein eigentlicher Abbau, ein Ableben oder Altern der Sorte, das auch unter gleichbleibenden günstigen Verhältnissen und bei Verwendung guten Saatgutes eintritt, ist nicht nachgewiesen und unwahrscheinlich."—Dr. C. FRUWIRTH, *Die Züchtung der landwirtschaftlichen Kulturpflanzen*, Band III. 14.

superior seed potatos, and raise them under suitable conditions!" A deterioration is just exactly what does happen, but it is no more due to degeneration proper (chromosomatic degeneration) than to mutation, for the sake of argument.

Fruwirth, Franz, Girard, Fischer, Seelhorst and others agree that unquestionably the selection of seed potatos may increase the yield, and prevent the decrease of yield of new varieties in a large measure. Experience and experiments have amply proven the correctness of this statement.

It is generally claimed by the practical grower that a variety of potatos, if grown for a longer or shorter period in one particular locality, will eventually give decreased yields, and generally show signs of "degeneration" or "running out." We are able from experience to corroborate this deterioration, but, whenever we have carefully investigated the question, we have been able to prove that such behaviour has been due to a variety of causes. There can be no doubt that certain localities, perhaps because of climatic or soil conditions, will more quickly affect the yielding capacity or vigour of a variety than other localities. Deterioration may also be due to the use for seed purposes of tubers originating in such localities. Indeed, the experience of the Dominion Horticulturist at the Central Experimental Farm has shown that Ottawa is a typical locality which affects detrimentally the quality, vigour, and type of potato varieties more quickly than has been found the case elsewhere.

The perpetuation of a variety in such unsuitable localities will gradually result in the production of an inferior type. But experience also shows that it is possible, by patient selection, and, above all, by growing these "varieties reduced in vigour" under more suitable conditions, for them to regain their pristine quality and vigour. Is this "regeneration"?

In view of the above explanations we do not consider such cases of loss of vigour in the light of true degeneration, but we have here evidence of a type of decline which we are inclined to regard as somatic deterioration, as opposed to true or chromosomatic degeneration. Somatic deterioration refers to the decline in the cells of any individual body, or to what is generally, but loosely, spoken of by the practical grower as running out, strain weakness, or "degeneration." It is very distinct from chromosomatic degeneration, since it is not due to any parental imperfection, but is largely due to numerous conditions exerting an unfavourable influence upon the individual.

To use again an illustration which may bring home to the lay mind the essential difference between this deterioration and degeneration, an analogous case in human life—and one due also to similar unfavourable climatic causes—occurs in the undermining of European constitutions through residence in tropical countries. Is the grower with his "degeneration of potatos" sufficiently logical to dare apply the term "degenerate" to, say, our war-worn heroes invalided home

with broken health incurred from exposure to the damp and cold of trench life in winter?

It must be realized, then, that a potato plant grown under conditions of starvation will produce smaller tubers than one grown under the most favourable conditions; a tuber produced by the former plant—which tuber is merely a cutting—will produce a very superior yield if it is grown under the most favourable conditions. Hence the apparent deterioration is not inherited, since a cutting has no true parent plant from which to inherit anything; but it will continue to behave as the plant of origin did, providing the climatic, cultural, and other conditions are perfect.

We have mentioned above the decline of varieties due to unsuitable conditions. Continue growing plants under these conditions and you will gradually produce a weak plant offering no resistance to many kinds of disease, and these will then do the rest. The plant will eventually produce no yield to speak of, and farmers are satisfied that they have a case of "degeneration." We wish to oppose this conception very strongly. It is most misleading, and the use of the term is in a fair way to become stereotyped and be used popularly. But it has no bearing upon the true state of affairs.

Farmers and potato growers have the remedy for deterioration in their own hands. It is beyond question that some localities in every country are more unsuitable for the growing of good potatos than others. Where this is the case, growers are urgently advised to make a frequent change of seed. Preferably secure seed from a suitable locality every year, and then the grower will have no deterioration. By keeping one strain of potatos in cultivation too long under any but the most perfect conditions the yields will be unsatisfactory and diseases abundant. Even in localities where potatos do normally well, it is advisable to practise selection of seed along recognized lines. This will eventually result in the production of heavier yields, and produce a strain that will be successful for a longer or shorter time elsewhere. No attempt should be made to grow seed potatos in unsuitable localities. Then so-called "degeneration" will be a thing of the past.

COMMONPLACE NOTES.

VERANDAHS AND TEA HOUSES.

FELLOWS often want advice on the designs of Verandahs and Tea Houses. Fig. 115 is an illustration of Lady Theodora Guest's most elegant Tea House at Inwood. The illustration is excellent so far as it goes, but it fails, of course, to give any suggestion of colour, and this is a very strong point with the Tea House in question. The roof and dome are of bright green copper, reminding one on a small scale of the green roofs of Dresden; the six uprights of delicate wrought-iron work are painted red; and the floor is of a pink Italian composition, edged with white marble.

The Verandah is very broad, so that it affords a delightful shelter from the sun on a hot summer's day, furnished as it is with large wicker armchairs and plenty of cushions, and with tables to match. There is ample space for eight or ten friends to sit there in comfort any time from May to October and enjoy the tea and gossip which ladies so much delight in.

Lady Theodora has tried various creepers to clothe lightly without concealing the beautiful ironwork, and, after a good deal of trial and experience with such things as Hoyas and Passion-flowers and such like, has discarded them all in favour of *Cobaea scandens*, which is seen in the illustration. The flowers begin to open in June, and the plant's growth is so rapid that it very quickly covers the front of the Verandah without in any way concealing it. The flowers, which are most artistic as to both form and colour, are followed by the beautiful seed-cases which, as may be seen in the illustration, hang gracefully down somewhat like glorified acorns, 3 inches long, and of a rich, dark, polished green colour. These seed-cases, later on, open into three elongated segments, and the arrangement of the seeds inside is something to admire and to wonder at. Even in the last closing days of November, the festoons of flowers and of fruit are both still full of beauty and vigour.

THE LATE SIR JOSEPH DALTON HOOKER, V.M.H.

Sir Joseph Dalton Hooker passed away in 1911 full of years and honours; the greatest systematic botanist of his day, and one of the great men of the Victorian era, honoured wherever botany is studied. As Director of Kew, where he followed his father and developed his work, he was in close touch with the garden as well as with the herbarium, and his connexion with our Society was a long and useful one. He was appointed Chairman of the Scientific Committee on

its formation in 1872, and remained Chairman until his death thirty-nine years afterwards. Fig. 116 is from a photograph of a plaque placed in Westminster Abbey last year to his memory.

National Diploma in Horticulture.

The establishment by our Society under a scheme approved by the Board of Agriculture of a National Diploma in Horticulture has been already referred to several times. Two examinations are imposed upon candidates, both of a practical nature, a preliminary and a final, and only those with at least six years' practical experience in the garden are eligible for admission to the final examination. The first final examination was held in June 1915 (see p. 330), and the Diploma, of which a photograph is given at Fig. 117, has been awarded to the sixteen successful candidates.

Preliminary Recognition Certificate.

The need has often been felt for some sort of recognition to plants which, though they have not yet proved themselves worthy of an Award of Merit, or a First-Class Certificate, yet bid fair to be useful garden plants. With this in mind, the Council has established a Certificate of Preliminary Recognition (Fig. 118) to be given to plants over their probationary period, and to be replaced by a higher award later, if and when their early promise shall have been fulfilled.

AUTUMN CABBAGES AT WISLEY, 1915.

REPORT BY THE TRIALS OFFICER.

ONE HUNDRED AND FOURTEEN stocks of autumn cabbages were received at Wisley for trial, representing 94 varieties, of which 15 were red and 79 green. The seed was sown on April 14, and as a whole germination was excellent. The seedlings, when large enough, were planted out on deeply-dug and moderately-manured ground. During development in the seed-bed the plants were attacked by the cabbage-root maggot, but after transplanting little further trouble was caused by this pest. The season was, on the whole, a good one for cabbages and practically all the stocks grew away well, the cultivation being under the charge of Mr. J. Wilson, foreman in the Vegetable Department.

The trial was inspected by a Sub-Committee of the Fruit and Vegetable Committee on August 19 and September 30. The Committee considered that many of the large red varieties were unsuitable for cultivation in gardens owing to the large amount of space they require and the smallness of the hearts produced.

In this report the varieties are grouped under type headings, namely Drumhead, Oxheart, Sugarloaf, and York, but as these typical forms merge into one another it is difficult to ascertain in some cases to which group a variety really belongs.

The Committee considered the following varieties to be the best in the trial:—

I.—*Green Varieties.*

Barr's Autumn Exhibition.
Best of All.
Cooper's First.
Copenhagen Market.
Enkhuizen Glory.
Express.
Gibson's Dwarf Drumhead.
Harbinger.
Hurst's Earliest.
Sutton's Earliest.
Sutton's Little Gem.
Sutton's Tender and True.
Veitch's Earliest of All.
Wheeler's Imperial.

II.—*Red Varieties.*

Barr's Miniature Red.
Carter's Red Pickling.
Erfurt Early Red.
Sutton's Dwarf Blood Red.

List of Varieties.*

1. Red Dutch, Veitch's. II.
2. Dwarf Blood Red, Sutton's. II.
3. Miniature Red, Barr's. II.
4. Red Danish Stonehead. II.
5. Red Stonehead. II.
6. Red Negro Head. II.
7. Red Zenith. II.

8., 8a. } Red Pickling, Carter's. II.

9. Early Blood Red. II.
10. Large Blood Red, Carter's. II.
11. Red Manchester. II.

12., 12a. } Red Drumhead. II.

13. Red Dutch Improved. II.
14. Erfurt Early Red. II.
15. Erfurt Dark Red. II.
16. Petsai III.
17. *Brassica chinensis* III.
18. Market Perfection, Toogood's. Ia.
19. Favourite. Ie.
20. First of All. Ic.
21. First Crop. Ic.
22. Primus. Ia

23., 24. } Best of All. Ic.

25. Little Queen. Ic.
26. Express, Toogood's. Ie.
27. Express. Ie.
28. Market Queen. Ic.
29. Tender and True, Sutton's. Ic.
30. Earliest of All, Veitch's. Ic.
31. Earliest, Sutton's. Ic.
32. Earliest, Hurst's. Ic.
33. Earliest of All, Toogood's. Ie.
34. Trusty, Toogood's. Ie.

35., 36. } First, Cooper's. Ic

37. Nonpareil, Sutton's Improved. Ic.
38. Nonpareil, Prince's Improved. Ic.
39. Nonpareil, Shaw's. Ic.
40. Nonpareil, Carter's. Ic.
41. Nonpareil, small. Ic.

42., 43. } Nonpareil, Bellamy's. Ic.

44. Nonpareil Improved. Ic.
45. Nonpareil. Ic.
46. Little Gem, Sutton's. Ic.
47. Perfect Gem. Ic.
48. Early Gem. Ic.

49, 50 } Wheeler's Imperial. Ie.

51. Imperial, Carter's. Ie.

52, 53 } Wheeler's Imperial. Ie.

54. Harbinger. Ic.
55. Cocoanut. Ie.
56. Cannell's Defiance. Ic.
57. Hearting Couve. Ic.
58. Brother Jonathan. Ia.
59. Early Evesham. Ie.
60. Offenham, Myatt's Early. Ie.

61., 62. } Offenham.

63., 64. } McEwan's Early. Ic.

65. Earliest. Ic.
66. First and Best. Ic.
67. Heartwell. Ic.
68. Pioneer. Ie.
69. Model. Ie.
70. Summer, Carter's Ie.

71., 72 } Matchless Ie.

73., 74. } Ellam's Early Dwarf Ie.

75., 76. } Leeds Market. Ic.

77. Paris Market. Ic.
78. Rosette Colewort, Sutton's. Ia.
79. Sugarloaf. Id.
80. Leader. Ic
81. Advancer. Id.
82. All Heart, Sutton's. Ie.
83. Early Dwarf York. Ie.
84. Improved Winningstadt. Id.
85. Early Jersey Wakefield. Ic.
86. Winningstadt. Id.
87. Emperor. Ic.
88. Mammoth Beefheart. Ic.

89., 90. } Large York, Dobbie's. Ie.

91., 91a. } Large Early Market. Ic.

92. Imperial, Sutton's. Ie.
93. Maincrop, Sutton's. Ie.
94. Favourite, Sutton's. Ie.
95. Autumn Exhibition. Ic.
96. Christmas Drumhead. Ia.
97. Dwarf Early Solid, Barr's. Ib.
98. Cannonball, Toogood's. Ia.
99. Glory. Ia.

100., 101., 102. } Enkhuizen Glory. Ia.

103., 104. } Flat Swedish. Ib.

105. Copenhagen Market. Ia
106. St. John's Day. Ia.
107. Dwarf Drumhead, Gibson's. Ib.
108. Summer Drumhead, Sutton's. Ib.
109. Miniature Drumhead. Ib.
110. Large Drumhead. Ia.
111. Étampes Ic.
112. Enfield Market. Ie.
113. Early Rainham. Ie.
114. Battersea. Ic.

* See footnote p. 117

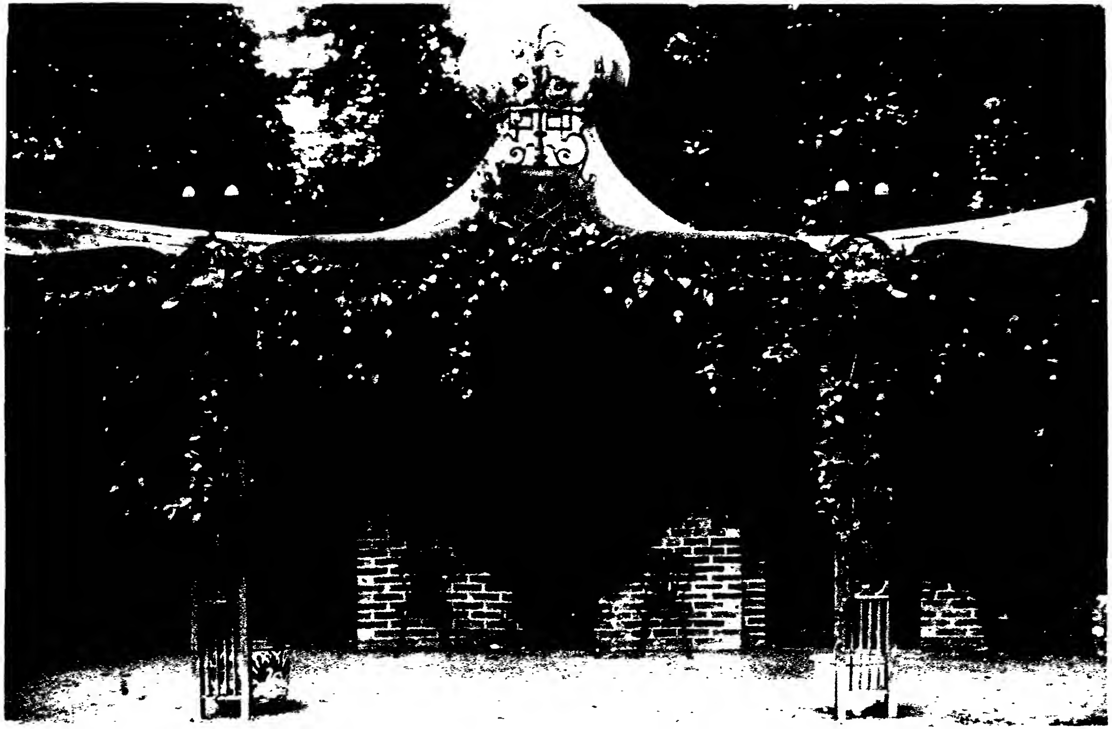


FIG. 115.—TEA HOUSE AT INWOOD WITH COBÆA SCANDENS CLIMBING OVER VERANDAH. (p. 469.)

[*To face p. 472.*

FIG. 116.—PLAQUE PLACED IN WESTMINSTER ABBEY TO THE MEMORY OF SIR JOSEPH DALTON HOOKER, O.M., V.M.H.

NATIONAL DIPLOMA IN HORTICULTURE.

THE PRESIDENT AND COUNCIL

OF THE

ROYAL HORTICULTURAL SOCIETY

HAVING SATISFIED THEMSELVES THAT

POSSESSES THE NECESSARY QUALIFICATIONS,

AND HAS CONFORMED WITH THE REGULATIONS GOVERNING

THE NATIONAL DIPLOMA IN HORTICULTURE

AS SANCTIONED AND APPROVED BY

THE BOARD OF AGRICULTURE AND FISHERIES.

AND HAS PASSED THE REQUIRED EXAMINATIONS IN

SECTION

HEREBY AWARD

THE NATIONAL DIPLOMA IN HORTICULTURE

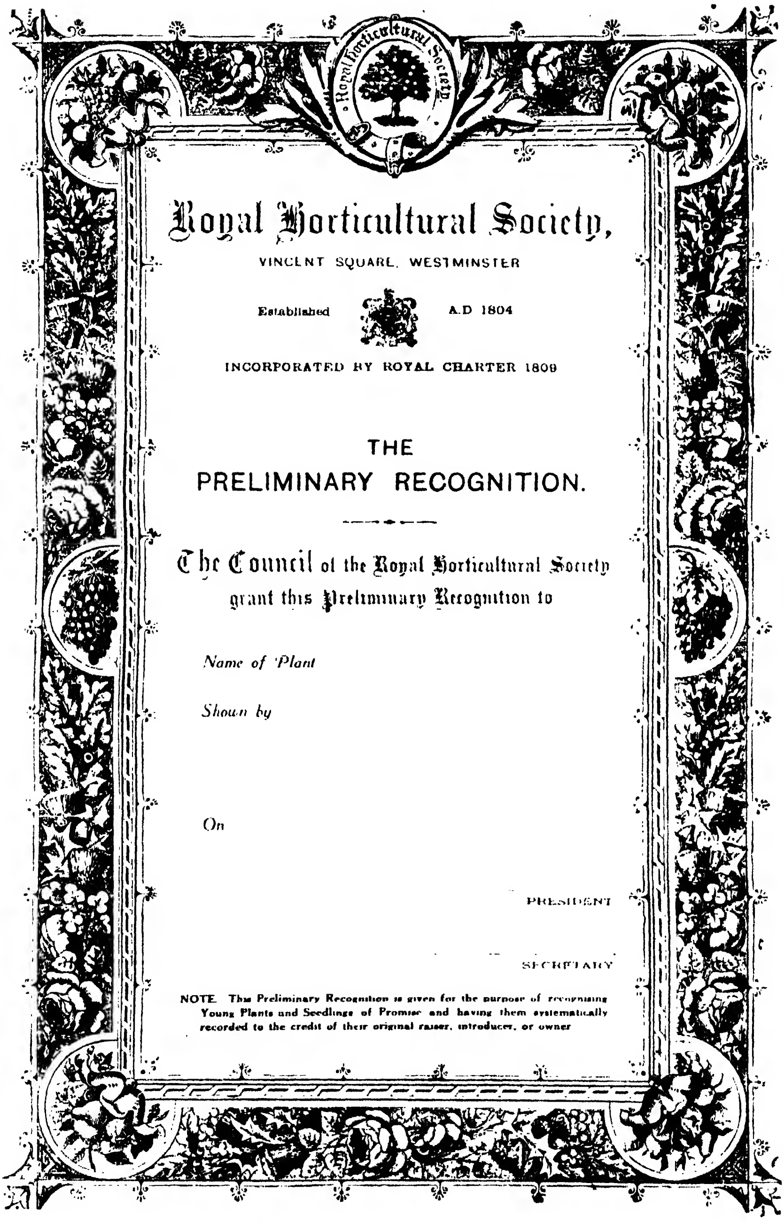
Seal
R H S

PRESIDENT

SECRETARY

DATE.

FIG. 117.



Royal Horticultural Society,

VINCENT SQUARE, WESTMINSTER

Established A.D. 1804

INCORPORATED BY ROYAL CHARTER 1809

THE

PRELIMINARY RECOGNITION.

The Council of the Royal Horticultural Society grant this Preliminary Recognition to

Name of Plant

Shown by

On

PRESIDENT

SECRETARY

NOTE. This Preliminary Recognition is given for the purpose of recognising Young Plants and Seedlings of Promise and having them systematically recorded to the credit of their original raiser, introducer, or owner.

FIG. 118.

[*To face p.* 473.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.
XXX = Highly Commended.
XX = Commended.
Confd. = Previous Award Confirmed

I.—Green Varieties.

a. Oval Drumhead type.

58. Brother Jonathan (*Toogood*).*—Plant of medium size; head of medium size, oval, pointed, solid. Ready August 12

98 Cannonball (*Toogood*).—Plant fairly large; growth rather spreading; foliage broad, very glaucous; head 7 inches across, loose, surrounded by much useless outer foliage. Ready September 10.

96. Christmas Drumhead (Barr; *Vilmorin*), **A.M.** December 12, 1893—Plant of medium size; foliage abundant, rather coarse, deep green, glaucous, of incurved rosette habit; head of medium size, fairly firm. Ready September 20. Stock not quite true.

105 Copenhagen Market (Watkins & Simpson; *Vilmorin*), **XX** October 12, 1915.—Plant of medium size; foliage broad, compact; head very good, 8 inches across, fairly solid. Ready September 10

100, 101,† 102. Enkhuizen Glory (Dobbie, Watkins & Simpson; *Sluis & Grook*), **XXX** October 12, 1915.—Plant of medium size with little outer foliage; head 8 inches across, almost round, solid. Ready September 10. Stocks all fairly good, but No. 100 was the best.

99. Glory (Barr).—Identical with 'Enkhuizen Glory.'

110 Large Drumhead (Barr).—Plant fairly large, foliage turned outwards in rosette habit; head of medium size, moderately firm. Ready November 1.

18. Market Perfection (*Toogood*).—A very mixed stock of various types.

22. Primus (Barr; *Watkins & Simpson*).—Very like 'St. John's Day.'

78. Rosette Colewort (Sutton).—Plant large, tall; foliage incurved, deep green, glaucous; head small, nearly round, moderately solid. Ready September 8.

106. St. John's Day (Barr; *Wythes*), **A.M.** September 10, 1895.—Plant of medium size, very dwarf, having all the characters of a 'Drumhead' without the glaucous leaves; head about 6 inches across, solid, of good colour, one of the earliest, remaining in good condition for some time. Ready August 18.

* The name in roman letters in brackets is that of the sender to the trial, that in italics of the raiser or introducer. Where only one name occurs and that in italics the sender was also the raiser or introducer.

† Obtained for comparison.

b. Flat Drumhead type.

97. Dwarf Early Solid (*Barr*).—Plant of medium size, vigorous; outer foliage little, fairly compact; head good, 8 inches across, fairly firm, stands well. Ready September 10.

107. Dwarf Drumhead, Gibson's (Barr), **XXX** October 12, 1915.—Plant very large; not much outer foliage; head 10 inches across, rather thin in proportion to width, fairly solid. Ready September 10. Fairly good stock.

103, 104. Flat Swedish (Barr, Watkins & Simpson).—Plant of large size; much outer foliage; head 9 inches across, flat-topped, not very firm. Ready September 1.

109. Miniature Drumhead (*Carter*).—Plant large; very little outer foliage; heads 10 inches across, rather loose. Stock not true. Ready September 10.

108. Summer Drumhead, Sutton's (*Sutton*).—Plant very large, rather coarse; little outer foliage; heads 10 inches across, fairly solid. A good even stock. Ready August 8.

c. Oxheart type.

95. Autumn Exhibition (Barr), **A.M.** August 25, 1908.—Plant of medium size, vigorous; outer leaves few, of medium size; head small, very solid, pointed, stands well. Ready August 16. Stock not quite true.

114. Battersea.—Plant of medium size, fairly compact; not much outer foliage; head of medium size, obtusely pointed, solid. Ready for use by August 25.

23, †24. Best of All (*Barr*), **A.M.** August 13, 1901.—Plant of medium size, compact; outer leaves few, small, light green. Head of medium size, obtusely pointed, very solid, almost white, coming into use earlier than any other variety in this trial. Ready July 24. Stock No. 24 not quite true.

†56. Cannell's Defiance, **F.C.C.** September 11, 1900.—Plant of medium size, compact; little foliage; head medium size, obtuse, solid. Ready August 12.

31. Earliest (Sutton), **A.M.** June 17, 1897.—Plant of medium size, compact; very little foliage; head of medium size, rather obtusely pointed; solid, almost white; stands fairly well. Ready August 2.

32. Earliest (Hurst), **XXX** October 12, 1915.—Similar to No. 31.

65. Earliest (Dobbie).—The same type as 'Best of All,' but much more leafy; matures later. Ready August 18.

30. Earliest of All (*R. Veitch*), **A.M.** June 15, 1897.—Identical with No. 31.

48. Early Gem (Barr; *Nutting*).—Like No. 23, but not so good a stock.

† Obtained for comparison.

85. Early Jersey Wakefield (Veitch).—Somewhat like No. 77, 'Paris Market,' but outside leaves different. Ready August 24.

87. Emperor (*Webb*).—Plant large; outer foliage spreading; head large, pointed, not very solid. Ready August 31.

†111. Étampes, **A.M.** August 25, 1908.—Plant rather small, compact, erect; foliage of medium size, dark; head of medium size, pointed, not very solid. Ready August 25.

35, †36. First (*Cooper-Taber*), **XX** October 12, 1915.—Plant large, rather spreading; much large outer foliage; head large, broad, obtusely pointed; stands well. Ready August 8.

†21. First Crop, **A.M.** August 25, 1908.—Plant rather small, compact, with a fair spread of outer foliage, small but broad; head small, rounded, fairly solid. Ready August 8.

66. First and Best (Sydenham).—Similar to 'First,' except that the head is a little taller and does not mature so quickly. Ready September 9.

20. First of All (*Webb*).—Stock mixed.

54. Harbinger (Nutting; *Sutton*), **A.M.** May 9, 1911, **Confd.**—Similar to 'First,' except that it has fewer outer leaves; may be planted close together. Ready July 26.

57. Hearting Couve (*Sutton*).—Plant large, spreading; foliage large, much frilled; midribs large, succulent, white; very loose head; many specimens failed to "heart" by September 20.

67. Heartwell (*Carter*).—Similar to 'First and Best,' but stock not quite true.

38. Improved Nonpareil, Prince's (Nutting; *Prince*), **A.M.** August 13, 1901.—Plant of medium size, compact; little outer foliage; head of medium size, tall, rounded; moderately firm. Ready August 6. Stock not quite true.

37. Improved Nonpareil, Sutton's (*Sutton*), **A.M.** August 25, 1908.—A better stock of 'Prince's Improved Nonpareil,' perhaps a little smaller.

44. Improved Dwarf Nonpareil (*Barr*).—Rather smaller, but otherwise like 'Sutton's Improved Nonpareil.'

91, †91*a*. Large Early Market (Nutting).—Plant of medium size, compact; a fair spread of outer foliage; head of medium size, pointed, fairly solid. Ready September 9.

80. Leader (*Webb*).—Stock mixed.

75, 76. Leeds Market (Barr, Nutting), **A.M.** September 10, 1895.—Plant of medium size, having a distinct rosette shape; foliage rather large; head of medium size, obtusely pointed, flattens with age, solid. Ready August 18. Stocks not quite true.

46. Little Gem (*Sutton*), **A.M.** September 10, 1895.—A fair stock of 'First Crop.'

25. Little Queen (*Barr*), **A.M.** August 13, 1901.—A small, compact form of No. 21. Stock not quite true, variable in size.

† Obtained for comparison.

88. Mammoth Beefheart (*Carter*).—Similar to 'Emperor.'

†28. Market Green.—Plant of medium size, moderately compact, with many rather large outer leaves; head of medium size, rounded, solid. Ready August 8.

63, 64. McEwan's Early (Barr, Dobbie).—Plant of medium size; not very much foliage; head of medium size, broad at base, obtusely pointed, not very solid. Ready September 9. Stock No. 63 was not true.

42, 43. Nonpareil, Bellamy's (Barr, Watkins & Simpson; *Watkins & Simpson*).—Plant large, moderately compact; not much outer foliage; head large, elongated, obtusely pointed, fairly solid. Ready August 8. Stock No. 43 was not quite true.

40. Nonpareil, Carter's (*Carter*).—A larger and more frilled form of 'Sutton's Improved Nonpareil.'

39. Nonpareil, Shaw's (Watkins & Simpson).—Similar to 'Sutton's Improved Nonpareil.'

45. Nonpareil (Simpson).—Much like 'Nonpareil Improved,' but a little later and not quite so good a stock.

†41. Small Nonpareil.—A slightly smaller form of 'Sutton's Improved Nonpareil.'

†77. Paris Market, **A.M.** August 25, 1908.—Larger, but generally like No. 23; the outer leaves are more upstanding. Ready August 1.

47. Perfect Gem (Dobbie).—Plant of medium size, compact; not much outer foliage; head small, broad at base, obtusely pointed, very solid. Ready August 14.

29. Tender and True (*Sutton*), **XXX** October 12, 1915.—Plant of medium size, compact; foliage rather coarse, dark; head rather small, obtusely pointed, solid. Ready August 8.

d. Sugarloaf type.

81. Advancer (Simpson).—A very leafy mixed stock, mostly of this type.

84. Improved Winningstadt (*Dobbie*).—Like 'Winningstadt.' Ready September 9.

79. Sugarloaf (Barr).—Plant large, spreading, erect, with much outer foliage; head large, tall, rounded at top, fairly solid. Ready August 25.

86. Winningstadt (Barr).—Plant fairly large, spreading, with rather many outer leaves, some slightly crimped, deep glaucous blue-green; head of medium size, elongated, obtusely pointed, moderately firm. Ready September 9.

e. York type.

82. All Heart (*Sutton*), **A.M.** August 25, 1908.—Plant fairly large, growth spreading; leaves rather large, curved outwards; head of medium size, tall, acutely pointed, moderately firm. Ready August 31.

55. Cocoanut (*Carter*).—Stock much mixed.

33. Earliest of All (*Toogood*).—A coarse mixed stock.

† Obtained for comparison.

83. Early Dwarf York (Barr).—Head elongated, obtusely pointed; stock mixed.

59. Early Evesham (Nutting; *Myatt*), **A.M.** August 25, 1908.—Plant of medium size, fairly compact; leaves large, thick, very glaucous; head of medium size, pointed, moderately solid. Ready August 14.

†113. Early Rainham.—Stock mixed.

73, 74. Ellam's Early Dwarf (*Watkins & Simpson*, Barr), **F.C.C.** April 8, 1884.—Plant small, compact, with very little outer foliage; head small, elongated, obtusely pointed, solid. Stocks very good. Ready August 24.

†112. Enfield Market.—A strong form of No. 59.

27. Express (Nutting; *Vilmorin*), **F.C.C.** July 9, 1888.—Plant of medium size, compact; very few small pale outer leaves; head of medium size, obtusely pointed, very solid; stands fairly well. Ready August 1.

94. Favourite (*Sutton*).—Plant fairly large, rather spreading; a fair spread of outer foliage; head of medium size, moderately solid. Ready September 10.

19. Favourite (*Webb*).—Similar to 'Sutton's Favourite,' but not such a good stock.

51. Imperial (Carter).—See 'Wheeler's Imperial.'

92. Imperial (*Sutton*).—Similar to 'Wheeler's Imperial.'

89, 90.—Large York (Dobbie, Barr).—Plant rather small; growth compact, erect; foliage of medium size, dark; head of medium size, much elongated, pointed, moderately firm. Ready September 9. Stock No. 89 was mixed.

93. Maincrop (*Sutton*).—Similar to 'Sutton's Favourite.'

71, †72. Matchless (*Carter*).—Plant fairly large, fairly compact; a fair spread of outer leaves; head fairly large, obtusely pointed, fairly solid. Ready August 25.

69. Model (*Carter*).—Similar to 'Sutton's Maincrop,' but not such a good stock.

60. Myatt's Early Offenham (Sydenham; *Myatt*).—Similar to 'Early Evesham.'

61, †62. Offenham (Simpson).—Similar to 'Early Evesham,' but less true stocks.

68. Pioneer (*Carter*).—A very irregular, mixed stock.

70. Summer (*Carter*).—Plant of medium size, fairly compact; a fair spread of outer leaves; head fairly small, moderately firm. Ready September 9.

26. Toogood's Express (*Toogood*).—Plant of medium size, fairly compact; very little foliage; head rather small, solid, obtusely pointed. Ready August 8. A fairly good stock.

34. Trusty (*Toogood*).—Plant of medium size; a fair spread of very glaucous outer foliage; head of medium size, obtusely pointed, solid. Ready August 8. Stock not quite true.

† Obtained for comparison.

49, 50, 52, †53. Wheeler's Imperial (Nutting, Watkins & Simpson, Veitch; *Wheeler*), **A.M.** August 25, 1908.—Plant rather small, compact, with a fair spread of outer leaves, small but broad, dark; head rather small, elongated, very firm, comes into use quickly and soon spoils. Ready August 20. Stock No. 53 was not quite true.

II.—Red Varieties.

All of Drumhead type.

2. Dwarf Blood Red (*Sutton*), **XX** October 12, 1915.—Plant of medium size, compact, with very little outer foliage; leaves purple; veins dark; head rather small, elliptical, solid, of good colour. Ready September 6. Stock not quite true.

15. Erfurt Dark Red (Barr).—Plant of medium size, fairly compact; a fair spread of outer foliage; head of medium size, round, fairly solid. Ready September 20.

14. Erfurt Early Red (Barr).—**A.M.** September 10, 1895, **Confd.**—Plant small, very compact; practically no outer foliage; head small, flattish, very solid, of deep colour. Ready September 10.

9. Early Blood Red (Sydenham).— } Syn.
10. Large Blood Red (*Carter*).— } Plant large, spreading; much large outer foliage; head of medium size, round, moderately firm. Ready September 20.

3. Miniature Red (*Barr*), **XXX** October 12, 1915.—A very good stock of 'Dwarf Blood Red.'

4. Red Danish Stonehead (Barr).—Plant large, spreading; much large outer foliage; head of medium size, round, loose, of good colour. Ready September 20.

12, †12*a*. Red Drumhead (Barr).—Plant fairly large, rather spreading, with a fair amount of outer foliage; head of medium size, round, moderately solid. Ready September 20.

1. Red Dutch (Veitch).—Plant large, rather spreading, very leafy; head of medium size, nearly round, loose. Ready September 20.

13. Red Dutch Improved (Barr).—A good stock of 'Red Dutch.'

11. Red Manchester (Barr).—A large, irregular stock, very like 'Red Danish Stonehead.'

6. Red Negro Head (Barr; *Heinemann*).—Plant very large, spreading; a fair spread of outer leaves; head large, flattish. Ready September 10.

8, †8*a*. Red Pickling (*Carter*), **XX** October 12, 1915.—Plant large, fairly compact; a fair spread of outer foliage; head large, elliptical, solid, of good colour. Ready September 10. Very good even stocks.

5. Red Stonehead (Watkins & Simpson).—See 'Red Danish Stonehead.'

7. Red Zenith (Barr).—Like No. 6.

† Obtained for comparison.

PARSNIPS AT WISLEY, 1915.

Report by S. T. Wright, Superintendent.

Forty stocks of Parsnips were sent to the Gardens for trial, all of which were sown on March 9, in rows, eighteen inches apart, in ground that had been deeply trenched, with no manure near the surface, as this causes the roots to fork; in fact the manure was all at the bottom of the trench. The germination was excellent except in one instance, viz. No. 36, which failed to germinate. The growth all through was very robust and clean, and all the roots were quite free of "rust."

XXX = Highly Commended.
XX = Commended.

1*. Student (Dawkins; Buckman), **XX,** 1915.—Medium to large, heavy shoulders, tapering rather quickly to thin root; of good shape; hollow crown; heavy crop. A well-known and favourite variety.

2. Student (Sydenham).—Medium to small; moderately shouldered; uneven in size; some hollow crowns, some full crowns; medium crop. Stock not quite true.

3. Student (Webb), **XXX,** 1915.—Medium to large; moderate shoulders, tapering gradually; very handsome, and even in size; crown nearly full; heavy crop. A fine selection of the popular variety.

4. Student (Sutton).—Very similar to No. 3.

5. Tender and True (*Sutton*).—Very similar to No. 3, except that the crown is full.

6. Dobbie's Selected (*Dobbie*).—Very similar to No. 3, but not quite such a fine selection.

7. Dobbie's Select (Hurst).—Light shoulders; medium size; long tapering root; full crown; moderate crop.

8. Hollow Crown (Sydenham).—Medium size; heavy shoulders, tapering rather sharply; even in size; skin very white and distinct; exceedingly heavy crop.

9. Hollow Crown (Dawkins).—Medium to large; moderate shoulders; long, thick, and uneven in size and shape; rather coarse; good crop; some crowns full, some hollow.

10. Champion Hollow Crown (*Rowan*).—Very similar to No. 9.

11. Elcombe's Improved (Dawkins).—Similar to No. 8.

12. Hollow Crown Improved (Barr), **XX,** 1915.—Large, heavy shoulders; very thick, long, tapering roots, even in size; very heavy crop.

13. Hollow Crown (Sutton).—Same as No. 8.

* See footnotes p. 117 and p. 473.

14. Selected Hollow Crown (*Webb*).—Medium to small; heavy shoulders; shapely, handsome roots, even in size; white skin; heavy crop.

15. Large Guernsey (Barr).—Medium size; heavy shoulders, tapering quickly; hollow crown, even in size; heavy crop.

16. Lisbonnais (Watkins & Simpson).—Very similar to No. 15.

17. Lisbonnais (Nutting).—Very similar to No. 15.

18. Improved Marrow (*Watkins & Simpson*).—Large, heavy shoulders; long, handsome, tapering roots with white skin; hollow crown, even in size; great crop.

19. Improved Marrow (*Toogood*).—Very similar to No. 18.

20. Webb's Marrowfat (*Webb*).—Medium to large; heavy shoulders; nearly full crown; tapers sharply; moderate length; good crop.

21. Model White (*Dickson*), **XX,** 1915.—Medium to large; heavy shoulders, tapering sharply; moderate length; skin very white; heavy crop; hollow crown.

22. Offenham (Watkins & Simpson).—Very similar to No. 21.

23. Broomhedge (*Dickson*).—Similar to 21.

24. Dublin Market (Nutting).—Very similar to No. 20.

25. Guernsey Intermediate (*Mauger*).—Very similar to No. 18.

26. Toogood's Intermediate (*Toogood*).—Very similar to No. 27.

27, 28. Lisbonnais (Barr, Hurst), **XX,** 1915.—Large and heavy, with big shoulders, tapering gradually; hollow crown; a few with full crowns; a much heavier Parsnip than Nos. 16 and 17. Great crop. Supposed to be of French or Spanish origin.

29. Offenham (Nutting).—Very much like No. 27 in all points.

30. Offenham Giant (Barr).—Very similar to No. 27.

31. Student (Barr).—Very similar to No. 3.

32. Tender and True (Barr), **XXX,** 1915.—Hollow crown; otherwise similar to No. 3.

33. Main Crop (*Dobbie*).—Similar to No. 27.

34, 35, 37. Intermediate (*Watkins & Simpson*, Dawkins, Barr), **XXX,** 1915.—Medium to small; heavy shoulders, tapering very quickly; roots short; full crown; good crop. This is a very short Parsnip, that can be boiled whole, and should be an acquisition for shallow soils where the long Parsnip is impossible.

36. Intermediate (Webb).—Failed to germinate.

38. New Globe (*Toogood*).—Turnip-rooted; very irregular in size; full crown; moderate crop. The Committee did not consider this variety of much value.

39. Turnip-rooted (Hurst).—Same as No. 38.

40. The Don (Kelway).—Very similar to No. 27.

BOOK REVIEWS.

" Botany : A Text-book for Senior Students." By D. Thoday. 8vo. 474 pp. (University Press, Cambridge. 1915.) 5*s.* 6*d.* net.

This volume of 474 pages, well illustrated with 205 figures in the text, is exceedingly clear and accurate in details, and presumably capable of meeting any questions in the " Senior Cambridge Local Examinations, for which it is primarily intended." It is divided into five sections. I. deals with the Functions of Plant Organs and Food of Plants, but only with the vegetative organs. The various subjects, as chemistry of nutrition, growth and respiration, &c., are concise and on the whole accurate ; but with regard to *Transpiration*, the author regards it as a function of heat, whereas it is one of light, for maxima always occur under red and violet glasses ; while *Assimilation is mainly under yellow and blue.** The author does not appear to distinguish transpiration from evaporation ; for the former is caused by light,† the latter by heat. Moreover, no mention is made of having tested with the spectroscope the glasses used.

II. deals with Form and Structure, III. with the Reproductive Organs, IV. is on Classification and Evolution, V. on Ecology.

Ecology, or " The Study of Plants in relation to Environment," is allowed one page (385), whereas Evolution is the outcome of Ecology. The author makes no allusion to Darwin's and Warming's contention that species arise by *direct adaptation* to new environments ; while Schimper asserts that *this* is the most important part of Ecology. The author still alludes to the struggle for existence as " bringing about a selection of the fittest," whereas Darwin tells us that natural selection is not required.‡

The author approaches very near to the true cause of evolution in saying " Our object will be to discover, as far as we can, in what special ways the plants *are adapted* to their environment." If for " are adapted " he had written " adapt themselves," the Rubicon would have been passed !

" My Garden in Autumn and Winter." By E. A. Bowles, M.A. 8vo. viii + 272 pp. (Jack, London, 1915.) 5*s.* net.

Too many, with the passing of the summer flowers, shut to the garden door, write on it " Ichabod," and pass that way no more till the lure of the flaming tulip and the warm promise of summer call

* "On some Effects of growing Plants under Glasses of different Colours," *Jour. Roy. Hort. Soc.* 1893.

† See *Journ. Linn. Soc.* vol. xxii. p. 81 and vol. xxiv. p. 286.

‡ *Variation, &c.*, ii. pp. 271, 272.

them again. Too often the glory has departed, and the on-coming of autumn in the garden only wakes thoughts of a grey, unkind winter, full of gloom, without a ray of brightness to mitigate its leaden heaviness. It need not be so, for he who seeks may find, and if he take as guide this, the best of the trilogy Mr. Bowles has given us of his garden, he will find. His "Garden in Spring" and his "Garden in Summer" were full of good things, and no less full is the "Garden in Autumn and Winter"; nor does he weary as he takes us with genial kindly guidance from river-bank to rock-garden, from wall to level lawn, to see the treasures his garden holds.

Apart from their economic uses, we grow plants for various reasons. Some have them because they like masses of colour to catch their eye as they walk abroad; some because it pleases them to watch how their treasures grow and respond to their surroundings: some because of some quaintness plants possess, or for their individual beauty of form or marking; some for many reasons, and some for none other than that they love them (and they grow best for these). All these and others may find in this book suggestions for fulfilling their own particular fancy, and fresh ideas given freely, but with none of that ostentatious loftiness that some adopt when they tell what they believe to be the best way.

So rich is the author's garden that fully four hundred plants find mention for some beauty each has to give in the "dull months" of the year, and each month finds ome pleasant and profitable task for the garden-lover, even when chill winter holds the earth in frozen grip. Crocuses, the author's best love, and no one knows the Crocuses as he does, give him flowers from beginning of autumn to end of winter; Colchicums puzzle him and drive him to his books, and, as ever when one starts to discover the correct names of old garden plants, these puzzle still more; the tints of autumn foliage and bare branches please; the berries, the winter flowers, the ferns, and the evergreen shrubs and trees all combine to attract attention and excite admiration.

Out of the fulness of his knowledge and his love for his plants, Mr. Bowles has given us three books which will fulfil the aim he had in writing them, for they will interest people to collect and grow more plants than ever they dreamt of before.

The black and white illustrations in this volume are excellent, and we like the coloured ones better than in the other two.

"Complete Carnation Culture." By J. Harrison Dick. 8vo., 262 pp. (De La More, New York, 1915.) $1.50.

Probably no flower is more esteemed by all classes than the Carnation, and, although much has been written since the double Carnation was mentioned some 400 years ago, its cultivation has increased in interest to the present, and while flowers are grown it always will be of universal interest. Mr. Harrison Dick has most

ably dealt with his subject, not only for American growers but for British growers too. Every phase of the cultivation of Carnations is clearly described, and even the smallest grower can fully understand the advice given by the author and other well-known authorities. There are chapters on hybridizing and diseases and pests, as well as on cultural matters, very good illustrations, and a first-rate index.

"The Greenhouse: Its Flowers and Management." By H. H. Thomas. 8vo., 151 pp. (Cassell, London, 1915.) 1*s.* net.

A useful little book for amateur growers, not too technical, and therefore not confusing to the ordinary amateur.

"Bulb Growing for Amateurs." By H. H. Thomas. 8vo., 151 pp. (Cassell, London, 1915.) 1*s.* net.

In this handbook the author has done well to bring to the notice of the reader not only the advantage of paying more attention to bulbs for garden decoration, but also the vast field at his disposal, at a small cost. Very few amateurs are aware of the great variety at their command, and the beautiful effects obtainable. The book is well illustrated and nicely printed.

"Les Plantes des Montagnes et des Rochers: leur Acclimatation et leur Culture dans les Jardins." By H. Correvon. 8vo., 491 pp. (Chez l'auteur, Genève, 1914.) 10 francs.

To the serious rock gardener who takes it up in the hope that it will enrich his store of knowledge concerning the plants he loves, this book, with its ambitious title, will come as somewhat of a disappointment.

It contains, first, a preface by M. Correvon, giving his ideas as to what a garden should be, which are only moderately helpful. Then follow useful chapters on the cultivation of alpines from seed and in other ways. These are the most useful and profitable pages in the book. Afterwards come lists of plants which one expects to find purely alpine, but such is far from being the case. All sorts of plants are here, alpine, herbaceous, marsh plants, bulbous plants, and orchids. If any beginner should read this book and select his plants therefrom, his garden would be a strange medley of incongruous vegetation which would fill M. Correvon with despair. Any catalogue would be a better guide than this. But the book has some merit, the instructions as to how to make a rock garden being sound and the chapter on the cultivation of Lilies really helpful. The description as to the use of Sphagnum moss as a medium for the growth of the seeds of alpines is really instructive, though not entirely applicable to our moist British climate. A few illustrations would have enhanced the value of the book.

"A Naturalist in Madagascar." By James Sibree, F.R.G.S., Membre de l'Académie Malgache. 8vo. 320 pp., with 52 illustrations and 3 maps. (Seeley, Service, London: 1915.) 16*s*. net.

The scope of this work is set forth in the sub-title, which reads as follows: "A record of observation, experiences, and impressions made during a period of over fifty years' intimate association with the natives and study of the animal and vegetable life of the island." The author is a naturalist in the best sense of the term, and confesses to taking more delight in watching and recording the habits of animals and insects than in killing them for collections. It follows therefore that the volume records the impressions of an observer rather than the feats of a hunter. Few people, we imagine, realize that the great African island of Madagascar has an area exceeding that of France, Belgium, and Holland combined; yet such, we are told, is the case. The surface is diversified with mountain and plain, and luxurious forests clothe large areas. Although so close to the continent of Africa, the fauna is quite distinct and suggests interesting problems as to what were the land-connexions of the island in past geological time.

The profusion and luxuriance of the forest vegetation are described as very extraordinary, but, as in the case of the floras of other tropical countries, it is the colour and form of the foliage and not the flowers that form the most striking feature. The tropical floras present few such colour masses as the temperate zone affords, as, for example, in hills covered with heather, woods carpeted with bluebells or primroses, meadows with buttercups, or fields with scarlet poppies. The flora of Madagascar does, however, contain some of the wonders of the vegetable kingdom, such as, for example, the Traveller's Tree (*Ravenala madagascariensis*), the Lattice-leaf plant (*Ouvirandra fenestralis*), a curious pitcher-plant (*Nepenthes madagascariensis*), and numerous species of orchids, bamboos, tree-ferns, and palms. Amongst the latter is *Raphia ruffia*, the rofia or raffia palm, the leaf-cuticle of which forms the tying material largely used by gardeners. The description of this palm is worth quoting as an example of the author's style:—" The trunk has a rough and rugged surface, and this reaches the height of 20 to 30 feet; but the leaves are the most striking feature; they are magnificent plumes of enormous length, quite as long as the trunk itself. The midrib of these leaves has a very strong but light structure, some 4 or 5 inches wide at the base, and on this account it is largely used for ladders, for palanquin poles, for roofing, and indeed for anything needing lightness as well as strength. On these midribs are set a great number of grass-like pinnate fronds, from which string and fibre are prepared for weaving. Great clusters of seeds (or fruits ?), which are enclosed in a shiny brown skin, hang down from the top of the trunk. These are used for boxes to enclose small articles, as jewellery &c. At one part of our journey the only road was through an extensive sheet of water, through which rose

hundreds of *rofias*, like the interior of some great temple, a most peculiar and beautiful sight, the great fronds above us quite shutting out the sunshine and making a green twilight below them."

"With the Flowers and Trees in California." By Charles Francis Saunders. (Grant Richards, London, 1914.) 7*s*. 6*d*. net.

This is a delightful book for many reasons. The flowers of California are both beautiful and interesting enough to make a good subject. The author shows an intimate knowledge of the plants as they grow, and also of their botany as derived from books, and has evidently spent much time in studying records of the early pioneers and travellers. But much of its charm is due to the fact, stated in the preface, that "the author has tried to revive, as vividly as may be, the memory of his own delight and inquisitiveness" when he first saw the floral wealth of the country.

This he has thoroughly succeeded in doing, and many of the pages make one share the enthusiasm of a discovery and the pleasures of the excursions in the wilds. For much of the book consists of vivid descriptions of flower hunts and is arranged as conversations between an artist, guides and storekeepers, and a well-informed and kindly professor, from whom we get accurate and solid information with a tone of authority, but in everyday language, and much pleasanter to read than if the same facts had been quoted direct from the printed books and reports that doubtless furnished them. The Spanish and local names are always explained and accounted for, and add great interest to the whole.

As an instance we are told that the Spanish-Californian distinguishes the two forms of thicket undiscriminating Americans confuse as "scrub." Chamisal is one, and is a dense mass of *chamiso*, the Spanish name for Adenostoma or greasewood; chaparral, the other, consists of thorny shrubs and small trees, in which the *chaparro*, or scrub live-oak, predominates. Because a rider would get his clothing cut to shreds in passing through it, he envelops his legs in *chapparrajos*, leather overalls, that cowboys and novelists have shortened to "shaps." A chapter devoted to the Giant Redwood is absolutely thrilling, and the reader gets as much excited as to whether the accepted name shall be Wellingtonia, Washingtonia, or Sequoia as he would to discover the forger and villain, or stolen heir, in certain novels. The chapter on the early collectors is a very interesting one, and has much to say of David Douglas, "the man of grass," as the name given him by the Indians signified. Few realize how many good plants we owe to this intrepid collector, sent out by our Society in 1831. *Garrya elliptica*, and *Nemophila insignis*, and the Douglas Spruce, for instance, were among them, and his journals, recently published *in extenso* by the Royal Horticultural Society, are well worth study. Another fascinating chapter deals with the Indian uses of Californian plants. Food, medicine, soap, and weaving materials were ready to hand in the

native flora. The photographic illustrations are numerous and excellent, and make one long to follow the writer's trail among such interesting and beautiful plants.

It is curious that Mr. Saunders cannot make the leaves of *Schinus molle* dart on water, for it is an easy thing to do if one is careful to break the leaflet itself, and not only tear it off from the central rachis, and then drop it as evenly as possible on to water, so that the upper surface of the leaflet rests on the water and the under surface is uppermost and not wetted. Then the tiny boat should shoot along rapidly with the discharge of the oil from the broken end of the leaflet. It should never fail to go through the advertised performance if treated thus, and a quantity of leaflets dashing in all directions is a very curious and interesting sight.

"Climbing Plants." By William Watson. (Jack, London and Edinburgh [1915].) 2*s.* 6*d.* net.

The volumes of this deservedly popular series are too well known to need any lengthy notice to recommend them to the majority of Fellows of this Society. But this latest volume deals in such a comprehensive manner with one of the most interesting classes of plants that all should read it, even if they do not feel they must possess it. As in the former volumes, the editor has selected the man best fitted for the work to undertake it. Mr. Watson's vast knowledge of plants, and his exceptional opportunities of observing them under the favourable conditions provided by so large a garden as Kew, fit him to guide us in the selection of the best climbing plants for all possible uses. A glance at the chapter headings alone will show that he has given us richly of his experience. Hardy, greenhouse, or stove climbers each claim a chapter, and those suitable for pergolas and verandahs and for clothing trees are similarly treated. Then follow chapters on certain families; the Clematis, Roses, Ivy, Vines, and Gourds, and even Aroids and Climbing Orchids, have each their chapter. The latter part of the book consists of an alphabetical list of genera, wonderfully full for the size of the book. The best species of each are given, with cultural notes as to their requirements.

The illustrations are excellent, both the sixteen black-and-white and the eight coloured ones. Of the latter *Allamanda Schottii Hendersonii* is wonderfully good in its tones of yellow, but the brown buds and green leaves are too dark. *Ipomoea rubro-coerulea* is charming, and the red and white Lapagerias faithfully show the solidity of texture of the real flower. Unfortunately a remarkably starry flower with blue banded corona does duty for the pure ivory-white and rather rounded *Passiflora coerulea* 'Constance Elliott.'

I would not say that the form here figured is not as beautiful as the white-flowered one, but comparison with H. G. Moon's beautiful figure in *The Garden* for May 7, 1887, will show these two cannot represent the same form. Mr. Watson has some hard words and

amusing things to say about pergolas, and will only permit them as useful supports for climbers, and does not seem to realize that among Roses 'Jersey Beauty,' and of Brambles *Rubus flagelliformis* and *k. bambusarum*, and also *Clematis Armandii*, can be very beautiful throughout an average winter even when on a pergola. So, having found all the fault I can with this almost perfect book, I return to my main proposition—that here we have a very valuable guide to climbing plants, in a small compass and at a very reasonable price.

"Popular Hardy Perennials." By T. W. Sanders, F.L.S. (Collingridge, London [1915]). 5*s*. net.

Adds one more to the books designed to assist readers of limited knowledge and experience in finding worthy herbaceous plants for their borders. Its value to such will depend on the youth and credulity of the reader, and a certain amount of chance. For in an attempt to include all possibly popular perennials the writer has evidently gone beyond a personal and accurate knowledge of many. This is very noticeable in the dates of flowering given. For instance, those who expect flowers from *Anemone Pulsatilla* from May to June or from *A. blanda* in April will be disappointed in finding only seed-heads. *Eremurus Olgae* is the latest of all the species, and never, unless severely forced, flowers in May or June. *Epimedium pinnatum*, again, is in flower with the Wood Anemones and not in June. No word of warning is given to show that *Yucca aloifolia* and *Incarvillea variabilis* are not hardy, or that *Tellima grandiflora's* yellow flowers are by no means showy.

Lysimachia clethroides is named *Lythrum Salicaria roseum superbum* under its portrait. N. America is given as the home of the European *Gentiana Asclepiadea*. *Salvia Sclarea* is not perennial. The young may live long enough and the incredulous search further to discover the truth. A careful revision could make the book useful, for its plan is good, and the number of illustrations from photographs of the plants themselves, as well as of well-furnished borders, are very numerous, and some excellent. Others are taken from such poor scraps, as those of *Saxifraga cordifolia purpurea, Pulmonaria saccharata*, and *Onoclea sensibilis*, as to give but little idea of the value of the plants.

There are also useful lists at the end of the book of perennials arranged as to colour, fragrance, for town gardens, woodlands and chalky soils.

"Principles of Plant-Teratology." By W. C. Worsdell, F.L.S. Vol. 1. 8vo. xxiv + 270 pp. 25 plates. (Ray Society, London, 1915.) 25*s*. net.

In 1869 the Ray Society published "Vegetable Teratology: an account of the Principal Deviations from the Usual Structure of Plants," by Dr. Maxwell T. Masters. It is the best known, and probably the most used, of all the Ray Society's botanical publications, and it took its place at once as the standard publication in

English on the subject with which it deals and has retained that position ever since. It brought together a vast mass of observations on curious aberrations in growth among plants, and it stimulated others to observe and note such deviations as came within their ken.

No English-speaking authority has set himself the task of collecting and arranging the new facts since, nor have other peoples been much more diligent, for only one serious attempt has been made abroad. Mr. Worsdell, a member of our Scientific Committee, an acute botanist, and a painstaking investigator, has now essayed the task, and has brought together the results of his own observations and those of others, grouped them according to the parts of the plant to which the structures described belong, shown how the structures deviate from the normal, and attempted to point out why the deviations occur as they have. Two volumes are occupied by the discussion, the first being now published.

Many of the examples described have been brought before the meetings of the Scientific Committee from time to time, and are to be found recorded on the Minutes in our Journal; but authorities of all nationalities have been put under contribution, and valuable bibliographical lists are given at the end of every chapter.

It is hardly to be expected that complete lists of deviations from the normal would be included, but one or two omissions will strike observant gardeners as curious. Most have, for example, seen masses of adventitious shoots on the roots of cauliflowers or other members of the cabbage group at times; but, on the contrary, the many who have tried in vain to obtain buds from the tuberous root of the Dahlia will be interested in Fig. 34, where such a shoot is shown. (We once, and only once, saw such a shoot at Wisley, after many attempts had been made to obtain one.) Galls are not dealt with, except in a few cases and by occasional passing references.

Fasciation, leaf-fusions, enations, ascidia, and all sorts of curious deviations which excite the curiosity and wonder of the cultivator, are ably dealt with, and we have no doubt that this book will, like its predecessor, be valued as the one to which to refer when seeking knowledge of the curious phenomena with which it deals. We shall look forward to perusing the second volume on deviations from the normal in floral structures. The Ray Society is to be congratulated on publishing a work which bids fair to be a worthy successor to the valuable one published forty-six years ago.

The subject is one which the philosophical botanist will always treat either with a great deal of respect, or with scorn as beneath his contempt. The scorner is wrong, and not the least interesting and valuable part of the present book is that in which the philosophical side of the questions it deals with is discussed. The clash of battles between rival campaigners rings loud here and there. The advocates of the mechanistic and of the teleological theories of plant-life wage war; the upholders of the chemico-physical outlook towards the

plant wrestle with the vitalists, and the struggle sways first this way and then that. And some stand aside and mutely, perhaps, proclaim their agnosticism. But the author leaves no doubt on which side he stands, and probably his is the right course, for while we may explain much in terms of physics and chemistry, yet there is always that incommensurable factor which the intellect cannot yet grasp, and which we call life, which seems to modify and direct all the activities of the organism towards one end.

"The Door in the Wall: or the Story of My Garden." By Mrs. Duggan. 8vo. 30 pp. (*Country Life*, London, 1915.) 1s.

Only ten pages are occupied by the text of this beautifully produced little book, and they tell of a small garden of borders, lawn, and shrubberies tended by the author herself. She has written it to sell on behalf of the heroes of the Manchester Regiment who have been crippled in the war, and for this reason she is sure of our sympathy and our help, and the description of her town garden will itself interest many to attempt like triumphs, while the beautiful photographs (of which there are ten) of artistically grouped and excellently grown plants will well repay, by the pleasure they give and the lessons they teach, the cost of the book.

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Abbreviations.—cor. = corrected; il. = illustrations; introd. = introduction; pl. = plates; col. pl. = coloured plates; frontis. = frontispiece; port. = portrait; enl. = enlarged; coloph. = colophon; pre. = preface; rev. = revised.

ANGREVILLE, J. E. D'. La flore Valaisanne. Genève et Paris, 1862. 12mo. (1)

BAILEY, L. H. Plant-breeding. New edition, revised by A. W. GILBERT. New York, 1915. il. 8vo. (2)

—— The principles of fruit-growing, with applications to practice. 20th ed. New York, 1915. il. 8vo. (2)

BEUST, F. VON. Schlüssel zum Bestimmen aller in der Schweiz wild wachsenden Blüten-Pflanzen, sowie der für ein Herbarium wichtigen Sporenpflanzen, nach Ordnungen und Familien des natürlichen Systems. Zürich, 1889. 8vo. (1)

BONNIER, G. Les noms des fleurs trouvés par la méthode simple sans aucune notion de botanique. . . . Paris, n.d. il. col. il. 8vo. (1)

BÖTTNER, J. Praktische Gemüsegärtnerei. Sechste, verbesserte und vermehrte Auflage. Frankfurt a. d. Oder, 1911. il. 8vo. (1)

BOUCHÉ, J. Die insectenfressenden Pflanzen. Ein Beitrag zur Geschichte und Cultur derselben. Bonn, 1884. 2 pl. 8vo. (1)

BOULGER, G. S. The history of Kew Gardens: the connection of Kew with the history of botany. Richmond, Surrey [1915]. 8vo. (3)

BOWLES, E. A. My garden in autumn and winter. London, 1915. pl. col. pl. 8vo. (2)

BRANDT, G. N. Stauder en Vejledning for Havevenner. København, 1915. il. 8vo. (4)

—— [editor]. Roser en Vejledning for Havevenner. Med Bidrag af G. BECKER, E. ERSTAD-JØRGENSEN, J. K. JØRGENSEN, J. LIND, D. POULSEN. København, 1915. il. col. pl. 8vo. (4)

BRENCHLEY, W. E. Inorganic plant poisons and stimulants. Cambridge, 1914. pl. 8vo. (2)

BRITTEN, J., and BOULGER, G. S. Biographical index of British and Irish botanists. First supplement, 1893–97. London, 1899. 8vo. (5)

—— —— Second supplement, 1898–1902. London, 1905. 8vo. (5)

—— —— Third supplement, 1903–1907. London, 1908. 8vo. (5)

CAMERARIUS, J. Hortus medicus et philosophicus: in quo plurimarum stirpium breves descriptiones . . . Item sylva Hercynia . . . conscriptus . . . a J. THALIO. . . . Francofurti ad Moenum, 1588. sm. 4to. (1)

CAMERARIUS, J. Icones accurate nunc primum delineatae praecipuarum stirpium, quarum descriptiones tam in horto quam in sylva Hercynia suis locis habentur. Francofurti ad Moenum, 1588. il. sm. 4to. (1)

CASTLE, A. and E. Our sentimental garden. London, 1914. pref. il. col. pl. col. frontis. 8vo. (2)

CHABREY, D., *latinized* CHABRAEUS. Stirpium icones et sciagraphia: cum scriptorum circa eas consensu et dissensu: ac caeteris placrisque omnibus quae de plantarum natura, natalibus, synonymis, usu et virtutibus, scitu necessaria. Genevae, 1666. il. fol. (1)

CLARK, G. H., and MALTE, M. O. Fodder and pasture plants, with water-colour illustrations by N. CRIDDLE. Ottawa, 1913. col. pl. 8vo. (6)

COBBETT, W. The English gardener. . . . London, 1829. il. 12mo. (7)

COCKAYNE, L. New Zealand plants suitable for North American gardens. Wellington, N.Z., 1914. 8vo. (8)

COIT, J. E. Citrus fruits. An account of the citrus fruit industry, with special reference to California requirements and practices and similar conditions. New York, 1915. il. frontis. 8vo. (2)

COOK, E. T. Gardening for beginners. A handbook to the garden. 6th ed., fully rev., with additional chapters by F. W. HARVEY. London, 1914. il. col. pl. 8vo. (2)

COULTER, J. M. Fundamentals of plant-breeding. New York and Chicago, 1914. il. 8vo. (2)

—— The evolution of sex in plants. Chicago, 1914. il. 8vo. (2)

CRAMER, C. Ueber die insectenfressenden Pflanzen. Zurich, 1877. 8vo. (1)

CRESCENZI, P. DE'. [Trattato dell' agricoltura.] Tradotto . . . per F. SANSOVINO. . . . Venetia, 1561. il. sm. 4to. (1)

CUTHBERTSON, W. Sweet peas and antirrhinums (snapdragons). London, 1915. il. pl. col. frontis. 8vo. (2)

DALLA TORRE, K. W. VON. Beitrag zur Flora von Tirol und Vorarlberg. Aus dem floristischen Nachlasse von Prof. Dr. J. PEYRITSCH. Innsbruck, 1891. 8vo. (1)

—— and Graf v. SARNTHEIN, L. Die Farn- und Blütenpflanzen (Pteridophyta et Siphonogama) von Tirol, Vorarlberg, und Liechtenstein. Innsbruck, 1906–1909. 2 vols. 8vo. (1)

DARWIN, C. The power of movement in plants. Assisted by F. DARWIN. London, 1880. il. 8vo. (9)

DICK, J. HARRISON. Sweet peas for profit, cultivation—under glass and outdoors. A practical guide to modern methods of growing the sweet pea for market purposes. New York, 1914. il. ports. 8vo. (2)

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DUNCAN, F. M., and DUNCAN, L. T. Wonders of plant life. London [1914]. 6 vols. il. col. il. col. frontis. 8vo.

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EDGEWORTH, M. P. Pollen. London, 1877. pl. 8vo. (10)

ENTLEUTNER, A. Die immergrünen Ziergehölze von Süd-Tirol. München, 1891. pl. frontis. 8vo. (1)

FARTHING, F. H. The week-end gardener . . . a practical guide to the work of every week in the year, with special reference to favourite flowers and vegetables easy of cultivation. London, 1914. il. frontis. 8vo. (5)

FAWCETT, W., and RENDLE, A. B. Flora of Jamaica, containing descriptions of the flowering plants known from the island. Vol. 3, Dicotyledons, families *Piperaceae* to *Connaraceae*. London, 1914. il. pl. 8vo. (11)

FUCHS, L. New Kreüterbuch in welchem . . . die gantz histori . . . des meysten theyls der Kreüter so in Teütschen unnd andern Landen wachsen . . . abgebildet und contrafayt ist . . . . Basell, 1543. col. il. port. fol. (1)
Cap. clx. torn.

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HEDRICK, U. P., and others. The cherries of New York. Albany, 1915. col. pl. port. 4to. (12)

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JACCARD, H. Introduction au catalogue de la flore Valaisanne. Zurich, 1895. 4to. (1)

Extrait des Mém. Soc. Helv. Sci. Nat. xxxiv. 1895.

KILLIAS, E. Die Flora des Unterengadins, mit besonderer Berücksichtigung der speciellen Standorte und der allgemeinen Vegetationsverhältnisse. Ein Beitrag zur Kenntniss des Unterengadins. Chur, 1887–88. 8vo. (1)

Beilage zum xxxi. Jahresb. der Naturf. Gesellsch. Graubündens, Chur.

KING, MRS. F. The well-considered garden. With preface by G. JEKYLL. New York, 1915. pl. frontis. 8vo. (2)

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Issued as a Supplement to "Journal of Botany," 1915.

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WEATHERS, J. [editor]. Commercial gardening. A practical and scientific treatise for market gardeners, market growers, fruit, flower, and vegetable growers, nurserymen, &c., by many practical specialists, under the editorship of J. W. London, 1913. 4 vols. il. pl. col. pl. col. models. 8vo. (5)

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DICKSON, Messrs., Belfast. Parsnips (see p. 479); Potatos (see p. 290); Peas (see p. 277).
DOBBIE, Messrs., Edinburgh. Parsnips (see p. 479); Peas (see p. 277); Cabbages (see p. 471); Sunflowers; Potatos (see p. 290); seed of *Tithonia speciosa*; collection of Roses (planted in garden).
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HOUSE, Messrs., Bristol. Sedums. Included in nomenclature trial.

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Kent & Brydon, Messrs., Darlington. Potatos. See p. 290.
Kew, Royal Botanic Gardens. Collection of seeds. Plants raised for distribution. *Primula sinensis* (type). Growing on.
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Low, Messrs., Enfield. Begonias. Included in the trial.
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Macfarlane, Messrs., London. Auto-Pressure Jet for trial.
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Millin, E., Dunedin, New Zealand. Seed of *Viola Thompsonae.* Sown.
Miln, T. E., Chester. Potatos. See p. 290.
Milne, Sir Berkeley, Bt., K.C.B., C.G.V.O., Musselburgh. Collection of Orchids. Added to collection.
Milne-Redhead, G. B., Frome. Sedum. Included in nomenclature trial.
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Morris, H., Newport. Sample of 'Solupar' for trial.
Morris, S., Norwich. Collection of plants for the rock garden.
Notcutt, R. C., Woodbridge. Poppies. Included in trial.
Nutting, Messrs., London. Parsnips (see p. 479); Cabbages (see p. 471).
Owen, Lieut. G. M., London. Seeds and bulbs from Gallipoli.
Paine, C., London. Bulbs of *Veltheimia* and *Brunsvigia.* Growing on.
Pattisson, Messrs., Streatham. Cole's Patent turf renovator, Pattisson graduator distributor, Pattisson weeding fork. For trial.
Peake, Mrs., Newbury. Seeds from Rhodesia.
Pearson, Messrs., Lowdham. Cabbages. Included in trial. Cuttings of reverted Black Currant.
Peed, Messrs., Norwood. Begonia 'Roupell Gem.' Included in trial.
Peters, W., Leatherhead. Potato 'William Peters' (see p. 290).
Phipps & Ireland, Messrs., Barnham. Collection of Sedums. Included in nomenclature trial.

PIRIE, Misses, Ripley. Copies of R.H.S. JOURNAL. Deposited in Wisley Library.
PRATT, J., Newent. Seeds of *Agrostemma Githago.*
REUSS, L., Woking. Sedum. Planted in rock garden.
REUTHE, G., Keston. Irises. Included in trial.
RICHARDSON, H., Stockfield-on-Tyne. Aquilegia seed. Sown.
RICHMOND, Mrs., Lustleigh. Seeds of Australian Wattles.
ROSCOE, Miss, West Horsley. Seed of *Meconopsis himalayense.* Sown.
ROSE, Prof. J. N., Washington. *Cotyledon incarum, Villadia imbricata.* Planted in garden.
ROSS OF BLADENSBURG, Sir JOHN, Rostrevor. Collection of seeds.
ROWAN, Messrs., Dublin. Parsnip 'Champion Hollow Crown.' See p. 479.
RURAL INDUSTRIES, LTD., Norwich. Sweet Pea Hurdle.
SALMON, C. E., Reigate. Seeds.
SANDEMAN, Col. J. G., Hayling Island. Trapa nuts. Plants raised.
SANDER, Messrs., St. Albans. *Buddleia variabilis Veitchiana gigantea.* Planted in garden.
SANDS, W. E., Hillsborough. Potatos. See p. 290.
SARGENT, C., Battle. Potato 'Sargent's Seedling.' See p. 290.
SARGENT, Prof. C. S., Jamaica Plain, U.S.A. Seeds of *Juglans nigra.* Sown. Collection Ribes species. Planted in garden.
SARGENT, M., Merstham. Potato 'The Prize-winner.' See p. 290.
SCARLETT, Messrs., Edinburgh. Potatos. See p. 290.
SCHOBERTS, Messrs., London. Paraffin emulsion. See p. 230.
SHARPE, Messrs., Sleaford. Potato 'Denbigh Castle.' See p. 290.
SHAW, Messrs., Sheffield. Cabbage 'Jubilee.' Included in trial.
SIM, W., Fyvie. Potato 'Hero King.' See p. 290.
SIMPSON, Messrs., Birmingham. Potatos (see p. 290); Peas (see p. 277); Cabbages (see p. 471); Sunflowers; Oriental Poppies (included in trial).
SMITH, Messrs., Aberdeen. Potatos. See p. 290.
SMITH, Mrs., Eastbourne. Miscellaneous plants for the rock garden.
STARK, Messrs., Great Ryburgh. Potato 'Old Yellow Ashleaf.' See p. 290.
STAWARD, R., Hertford. Cabbage 'Matchless.' Included in trial.
STEPHENS, M., Peaslake. Begonia 'Glory of Cincinnati.' Included in trial.
STEWART, Mrs., London. Seeds of Giant Bamboo.
STRICKLAND, Miss, Wimbledon. Seeds from Norfolk Island.
SUTTON, Messrs., Reading. Parsnips (see p. 479); Potatos (see p. 290); annual Sunflowers; Cabbages (see p. 471); Peas (see p. 277); Marrows.
SYDENHAM, Messrs., Birmingham. Parsnips (see p. 479); Potatos (see p. 290); Cabbages (see p. 471); Peas (see p. 277); annual Sunflower.
THE FOUR OAKS SPRAYING MACHINE CO., Birmingham. Nozzles and sprayers for trial.
THE GUILDFORD HARDY PLANT NURSERY, Guildford. Sedums. Included in nomenclature trial.
THE HIGH COMMISSIONER FOR CANADA, London. Copy of 'Fodder and Pasture Plants.' Deposited in Wisley Library.
THE ONTARIO AGRICULTURAL COLLEGE, Guelph, Canada. Gooseberry cuttings. Growing on.
THE ROYAL TOTTENHAM NURSERIES, Dedemsvaart, Holland. Collection of Sedums. Included in nomenclature trial.
THE SANITAS CO., Ltd., London. 'Sanitas' powder.
THE WESTON CHEMICAL CO., Runcorn. Tins of Westoran.
TOOGOOD, Messrs., Southampton. Parsnips (see p. 479); Cabbages (see p. 471); Peas (see p. 277); Potatos (see p. 290); Sunflowers.
TRESEDER, Messrs., Truro. *Eucalyptus Deani, E. microcorys.* Planted in garden.
TREVOR-WILLIAMS, Mrs., Byfleet. *Schizostylis coccinea.* Growing on.
TURNER, C., Slough. Trees of Apple 'Arthur Turner.' Planted in garden.
UPSALA BOTANIC GARDEN. Collection of seeds. Plants raised for distribution.
VEITCH, Sir HARRY, V.M.H., London. Collection of Gooseberry and Currant bushes. Planted in garden.
VEITCH, Messrs., Exeter. Sedums (included in nomenclature trial); Sunflowers; Cabbages (see p. 471); Peas (see p. 277); Potatos (see p. 290); Oriental Poppies (included in trial); Pæonies (included in trial).
VIXOL, Messrs., London. Saponified Nicotine for trial.
VON GLEHN, Mrs., London. *Apera arundinacea.* Planted in garden.
VOSS, Messrs., London. Samples of Vossolite, Catterscab, and Voster. Solidified Winter Wash.
WAKELEY, C., Chelmsford. Begonias. Included in trial.

WALLACE, Messrs., Colchester. *Primula silvicola. P. obconica werringtonensis.* Irises. Included in trial. Poppies. Included in trial.

WARE, Messrs., Feltham. Collection of Sedums. Included in nomenclature trial. Pæonies. Included in trial.

WARREN, Miss. Collection of seeds.

WATERER SONS & CRISP, Messrs., Twyford. Sedums. Included in nomenclature trial. Lettuce 'Waterer's Excelsior.'

WATKINS, A., Twickenham. Seed of Polyanthus.

WATKINS & SIMPSON, Messrs., London. Parsnips (see p. 479); annual Sunflowers; Cabbages (see p. 471); Polyanthus 'Golden Yellow' (sown); Delphinium 'Azure Fairy,' D. 'Blue Butterfly' Improved.

WEBB, Messrs., Stourbridge. Parsnips (see p. 479); Potatos (see p. 290); Cabbages (see p. 471); Peas (see p. 277).

WEBSTER, T. H., Stock. Cascade nozzles for trial.

WEEKS, Messrs., Maidstone. Nozzles for trial.

WEIGHTMAN, J., Keswick. Cabbage 'Mighty Atom Early.' Included in trial.

WHITE, R. B., Garelochhead. Orchids. Added to collection.

WHYTE, R. B., Ottawa, Canada. Gooseberry cuttings. Growing on.

WILKS, Rev. W., M.A., V.M.H., Shirley. Seeds of Primulas, *Eucalyptus coccifera, Dryas Drummondi, Sisyrinchium filifolia, Anemone sulphurea,* plants from Scotland, seeds of *Cistus ladaniferus,* seeds of very large unspotted *Cistus ladaniferus* crossed with a chestnut-brown Helianthemum. Leaves of *Bryophyllum pinnatum.*

WILLIAMS, A. J., Carnarvon. Potatos. See p. 290.

WILLIAMS, P. D., St. Keverne. Seeds of *Magnolia salicifolia. Cistus algarvensis.* Escallonias, Rhododendrons. Planted in garden.

WILSON, Miss, Watford. Seeds of *Haemanthus, Veltheimia viridifolia,* and *Imantophyllum.* Sown. Bulbs of *Zephyranthes carinata.* Growing on.

WOOD, A. H., West Clandon. Copies of R.H.S. JOURNAL. Deposited in Wisley Library.

YATES, S., Manchester. Peas. See p. 277.

ANNUAL REPORT OF THE CONSULTING CHEMIST FOR 1915.

By Dr. J. A. Voelcker, M.A., F.I.C.

In the course of the year 1915 thirty samples were submitted to me by members of the Society for analysis. The list of these is as follows :—

Potash materials	2
Bone meal	1
Peruvian guano	2
Shoddy and wool waste	5
Concentrated phosphate	1
Compound manures	5
Lime	1
Soils	7
Water	1
Miscellaneous materials	5
	30

Potash Materials.—The effects of the war as regards the supply of fertilizers to horticulturists have been felt mainly in respect of potash materials, potash salts—which are obtained almost entirely from Germany—having been practically unprocurable. In consequence of this shortage, endeavours have been made to utilize different waste materials. Instances of this are the following :—

Paper Ash.

	Per cent.
Moisture	2·19
*Organic matter	9·83
†Phosphoric acid	·21
Lime	9·24
Potash	·83
Oxide of iron, alumina, carbonic acid, &c.	43·47
Insoluble siliceous matter	34·23
	100·00
* Containing nitrogen	·26
Equal to ammonia	·32
† Equal to tribasic phosphate of lime	·45

It will be noticed that this material contains an appreciable amount of potash.

Potash Material.

	Per cent.
Water	1·85
Matters insoluble in water	64·65
Silica	15·72
Total potash	16·30
Soluble potash	13·49
Equal to sulphate of potash	24·95

This material was offered at £6 5s. a ton delivered, and was guaranteed to contain 20 per cent. sulphate of potash. The potash was mainly in soluble and available condition, and, under present conditions, might be worth getting where potash is required.

Peruvian Guano.—Two samples of this were sent, the analyses being as follows:—

	Per cent.	Per cent.
Moisture	20·46	18·32
*Organic matter and salts of ammonia	36·51	34·37
†Phosphoric acid	13·73	14·25
Lime	10·98	11·43
Alkalies, &c.	9·51	8·36
Insoluble siliceous matter	8·81	13·27
	100·00	100·00
* Equal to phosphate of lime	30·00	31·13
† Containing nitrogen	9·76	9·01
Equal to ammonia	11·85	10·94

Both were of excellent quality. Peruvian guano, it may be pointed out, generally contains about 2 per cent. of potash.

Shoddy, Wool Waste, &c.—The following are analyses of materials sent:—

	Wool Waste.		Rabbit Flick.	Wool Combings.
	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	7·54	9·61	30·29	8·31
*Organic matter	72·91	67·10	65·22	65·97
Oxide of iron, alumina, &c.	6·01	8·13	3·21	2·64
Sand	13·54	15·16	1·28	23·08
	100·00	100·00	100·00	100·00
* Containing nitrogen	3·37	7·41	10·21	4·44
Equal to ammonia	4·09	8·99	12·40	5·39

Lime.—One sample of this material, intended for liming land, was submitted. On analysis it gave the following results:—

	Per cent.
Oxide of iron and alumina	2·59
Lime (CaO)	45·35
Magnesia	·75
Silica	9·95
Water, carbonic acid, &c.	41·36
	100·00

This sample was very damp and was much hydrated and carbonated, probably through exposure, so that the amount of caustic lime was not much more than half what it would be in a good sample of burnt lime.

Water.—One sample of water was sent for information as regards its suitability for horticultural purposes. It came from near Evesham, in Worcestershire. It was found to contain no less than 207·76 grains per gallon of total solid matters, and, inasmuch as these consisted very largely of sulphate of lime, the water was an extremely hard one and unsuitable alike for domestic and for horticultural purposes.

Soils.—(*a*) Soil for a kitchen-garden.

A sample of soil was sent me to know whether it was suitable for kitchen-garden purposes, and also for guidance as to how potash

might be supplied to it in the absence of stable manure. The analysis of the soil was as follows:—

(Soil dried at 212° F.)	Per cent.
Organic matter and loss on heating	10·88
Oxide of iron	3·64
Alumina	5·79
Lime	1·83
Magnesia	·50
Potash	·47
Soda	·27
Phosphoric acid	·65
Sulphuric acid	·11
Carbonic acid	·65
Insoluble silicates and sand	75·21
	100·00
Nitrogen	·419

The soil was a blackish-coloured loam of distinctly fertile character; and one that would, in the ordinary way, want practically nothing doing to it, inasmuch as it was well supplied with the main elements of fertility. The quantity of potash contained in the soil was distinctly above the average, and except for special purposes, such as the growing of fruit trees, I should hardly consider the additional application of potash salts as necessary. In the absence of stable manure, the best substitute would probably be Peruvian guano or fish manure.

(*b*) Soils containing magnesia in excess of lime.

I have, in previous reports, referred to cases where, in my opinion, the unsatisfactory nature of the soil has been due to the fact of magnesia being present in the soil in excess of the lime contained. I give now other two instances brought to my notice in the course of the year:—

1. *Garden Soil.*

(Soil dried at 212° F.)	Per cent.
Organic matter and loss on heating	6·57
Oxide of iron and alumina	7·80
Lime	·36
Magnesia	·80
Phosphoric acid	·31
Alkalies &c.	·67
Insoluble siliceous matter	83·49
	100·00

2. *Rose Soil.*

(Soil dried at 212° F.)	Per cent.
Organic matter and loss on heating	6·87
Oxide of iron	3·99
Alumina	5·37
Lime	1·13
Magnesia	1·99
Potash	·81
Soda	·33
Phosphoric acid	·31
Sulphuric acid	·03
Insoluble silicates and sand	79·17
	100·00
Nitrogen	·199

In both these cases the soil was not considered satisfactory, and it will be noticed that in each of them the magnesia was much in excess of the lime present. The remedy would be liberal liming of the soil.

(*c*) *Hop Soils.*—Two samples of soil which were sent to me from Kent for information as to their suitability for hop-growing gave the following analyses:—

(Soils dried at 212° F.)	Per cent.	Per cent.
Organic matter and loss on heating	4·66	3·60
Oxide of iron	2·37	2·05
Alumina	3·51	2·47
Lime	·86	·56
Magnesia	·33	·30
Potash	·32	·31
Soda	·17	·14
Phosphoric acid	·46	·39
Sulphuric acid	·06	·04
Insoluble silicates and sand	87·26	90·14
	100·00	100·00
Nitrogen	·191	·182

The soils were loams of somewhat light nature. The differences between them were but small, and the analyses showed that, for hop-growing purposes, they were both somewhat deficient in organic matter and in nitrogen.

In other respects they were very fairly supplied. Such soils as these would, no doubt, benefit by the use of shoddy, rape dust, or the like.

(*d*) *Orchard Soil.*—A sample of soil was sent me from land in Kent, which it was intended to use as an orchard.

(Soil dried at 212° F.)	Per cent.
Organic matter and loss on heating	4·42
Oxide of iron	1·86
Alumina	3·52
Lime	·33
Magnesia	·30
Potash	·24
Soda	·22
Phosphoric acid	·07
Sulphuric acid	·04
Insoluble silicates and sand	89·00
	100·00
Nitrogen	·189

The soil was a somewhat heavy clay loam with a heavy clay subsoil. It can by no means be described as a good soil for the purpose. The analysis shows two main deficiencies, viz. that of lime, and more particularly that of phosphoric acid.

Poisoning of Plants.—A matter was submitted to me in which there was suspicion of carnation plants having been killed by something applied to the soil. A sample of the soil was sent me, and also

a number of the injured carnation plants. The information given me was to the effect that the plants had been growing in a greenhouse, that upon one day they were alive and well, and that four days later nearly every plant was killed, including between two and three hundred carnations.

My examination of the soil showed the presence of notable quantities of both lead and arsenic, and, on further testing the damaged carnation plants, I obtained distinct indications of arsenic in them. I have little doubt, therefore, that the injury to the plants was due to some poisonous application.

Though I endeavoured to follow up the inquiry, I could only gather further that suspicion attached to a gardener on the establishment.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

The Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of giving references to papers, as the observance of an identical *order* renders subsequent reference to the original easy. The order is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 367, 368.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

Names of those who have kindly consented to help in this Work.

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Voss, W. A., F.C.S., F.R.H.S.
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Whittles, W., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton.	Ann. Rep. Agr. Res. Stn. Long Ashton.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d' Orticultura.	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal of the Society of Chemical Industry	Jour. Soc. Chem. Ind.

Journal S.E. Agricultural College, Wye . .	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst . .	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society .	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal . . .	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia .	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden . .	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh . . .	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc. .	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc. .	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc. .	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins .	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports . .	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications .	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report . . .	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.
† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abutilon Moth, The. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 126, December 1913 ; 5 plates).—The following is the formula used to spray Abutilon attacked by the larva of the Abutilon moth (*Cosmophila erosa* Hübn.) :

Nicotine sulphate, 40 per cent.	½ oz.
Whale oil soap	½ lb.
Lukewarm water	5 gallons.

The plants were sprayed in the morning while some dew remained on them. Two days after treatment 95 per cent. of the larvæ were found dead.—*V. G. J.*

Acanthopanax leucorrhizum (*Bot. Mag.* tab. 8607).—Central China. Family *Araliaceae.* Tribe *Panaceae.* Shrub 6–10 ft. high. Leaves deciduous 3–5-foliolate. Flowers yellowish-green, $\frac{3}{16}$ in. across. Fruit purplish-black, globose, ¼–⅜ in. long.—*G. H.*

Acer. By F. Dufour (*Le Jard.* vol. xxix. pp. 336–338; 5 figs.).—The following members of the large *Acer* family are the most suitable for the garden :—*A. eriocarpum* or *dasycarpum Wieri laciniatum*, deeply cut foliage ; *A. e. pulverulentum*, *A. Negundo foliis marginalis elegans*, *A. N. f. albo variegatis*, *A. N. f. aureo marginalis*, and *A. N. odessanum foliis aureis.* *Acer platanoides globosum*, a small tree, is strongly recommended. *A. p. Reichenbachii*, rich purple in autumn. *A. p. Schwedleri* is the most decorative variety ; the new shoots are red and the old foliage is bronze in colour. The best of the Sycamores are *A. Pseudoplatanus Leopoldii*, *A. P. Simon Louis*, *A. P. foliis atropurpureis*, and *A. P. Voorlii* with golden yellow leaves. *A. campestris*, the English Maple, *A. carpinifolium*, *A. creticum*, *A. macrophyllum*, *A. monspessulanum*, *A. nikoense*, a charming Japanese variety, *A. pennsylvanicum*, with beautiful bark. *A. rubrum*, the Scarlet Maple, is a beautiful ornamental tree with scarlet fruit and flowers. It likes a moist soil. *A. saccharinum*, the sugar Maple.

The most beautiful of the Japanese varieties are *A. japonicum atropurpureum*, *A. j. aureum dissectum* and *A. j. Parsonii*, *A. palmatum crispum*, and *A. p. sanguineum.*—*S. E. W.*

Aciphylla latifolia. By P. Hariot (*Le Jard.* vol. xxix. p. 312).—*Aciphylla latifolia* is an umbelliferous plant from New Zealand. Only the male form is known in cultivation. It attains a height of 4–6 feet, and the stem has a diameter of four inches at the base. The leaves are thick and leathery. The flowers are purple, and the umbels multifloral.—*S. E. W.*

Alkali Salts in Soils, Effect on the Germination and Growth of Crops. By F. S. Harris (*Jour. Agr. Res.* v. pp. 1–54 ; Oct. 4, 1915).—A very large number of experiments upon the effect of alkalis on plant-growth, are recorded. Only about half as much alkali is required to inhibit the growth of crops in sand as in loam. Crops vary greatly in their tolerance of alkali salts, barley being resistant, sugar-beet much less so. The results obtained by testing the toxicity of a salt in water culture are not always similar to that obtained when the salts are applied to soils. The percentage germination, the number of leaves borne by a plant, the quantity of dry matter, and the height of the plants are all affected in about the same ratio. The period of germination is considerably lengthened by the presence of soluble salts in the soil. The acid radicle, not the basic, determines the toxicity of alkali salts in the soil, chloride being the most toxic. The toxic effect of the salts was not found to be in all cases proportional to the osmotic pressure of the salts. The toxicity of soil-salts was found to be in the following order : sodium chloride, calcium chloride, potassium chloride, sodium nitrate, magnesium chloride, potassium nitrate, magnesium nitrate, sodium carbonate, potassium carbonate, sodium sulphate, potassium sulphate, magnesium sulphate. Salts added in a dry state do not have so great an effect as those added in solution. Land containing more than the following percentages of soluble salts are probably not suited without reclamation to produce ordinary

crops:—In loam, chlorides 0·3 per cent., nitrates 0·4 per cent., carbonates 0·5 per cent.; sulphates above 1 per cent. In coarse sand, chlorides 0·2 per cent., nitrates 0·3 per cent., carbonates 0·3 per cent., sulphates 0·6 per cent. *F. J. C.*

Allium, An, in the Mediterranean Region. By Dr. Trabut (*Rev. Hort. d'Alg.* No. 3, March 1914, p. 95).—*Allium triquetrum* is very common on the Algerian littoral, where it is found in the neighbourhood of houses and in gardens. It is much appreciated by the Kabyl population as a winter vegetable. The writer of this article made some experiments with it, and found that the wild form responded wonderfully to cultural care and that it produced a most acceptable new vegetable, resembling a leek, but milder in flavour. He considers that it would be well worth cultivating in the gardens of the Mediterranean shores. *M. L. H.*

Allium triquetrum. By L. Trabut (*Le Jard.* vol. xxviii. p. 188; 1 fig.).—This Allium is a native of Algiers. It can be grown on the south coast of France and used as a substitute for the leek. The bulbs should be planted 8 inches deep in good soil.—*S. E. W.*

Alpines, Propagation of, from Cuttings. By W. W. Besant (*Irish Gard.* Nov. 1915, p. 165).—Directions for making and caring for cuttings of various kinds. *Wahlenbergia gracilis*, *Morisia hypogaea*, and *Anchusa myositidiflora* are best raised from root cuttings.—*F. J. C.*

Alpinia mutica (*Bot. Mag.* tab. 8621).—Malaya. Family *Scitamineae.* Tribe *Zingiberaceae.* Herb, perennial. Stem 6–8 ft. high. Leaves linear-lanceolate, 1–2 ft. long. Panicle terminal. Calyx white, with a rosy-pink tip. Petals white, 1½ in. long; lip bluntly 3-lobed, yellow.—*G. H.*

Amelanchier florida (*Bot. Mag.* tab. 8611).—North America. Family *Rosaceae.* Tribe *Pomeae.* Shrub, 4–10 ft. high. Leaves deciduous, ovate, serrate, 1¾ in. long. Flowers ¾ in. across, petals white. Fruit ovoid to globose, ¼ in. long, black, with purple bloom.—*G. H.*

Apple and Pear Diseases. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 51–57, 105–113; 12 plates).—Bitter Pit of the Apple often appears when the fruit is on the tree, but sometimes it only becomes visible in store. The apples exhibit depressed roundish pits from ⅛ to ¼ inch in diameter. The apple turns brown, the pulp soft and shrivelled, but there is no breaking of the skin. The disease is neither contagious nor infectious. Fluctuations in temperature and moisture are the principal factors which contribute to the development of this disease. It is not due to insects, fungi, bacteria, hail, or various sprays, but to the insufficient development of the terminations of the vascular bundles in the fruit and the lack of nourishment of the adjacent cells. To diminish the disease the following recommendations are made:—1. Light pruning; 2, thinning not to be excessive; 3, avoid irregular stimulation in the growing period of the fruit; 4, not to pluck the crop too late; 5, not to have the store-room too dry.

Glassiness or water core of the apple is also due to internal causes, and is prevalent when the apples ripen in a rainy season. No cure is known.

Mouldy core is found in those kinds of apples which have a small channel between the eye and the interior of the core, *e.g.* 'Cleopatra,' 'Annie Elizabeth,' and 'London Pippin.' Fungi may be blown into this open channel and cause mould.

Apple Scab is due to a fungus known as *Fusicladium dendriticum*, and as *Venturia inaequalis* in another stage. To remove the source of infection, dig in or burn all fallen leaves. Spray three times with Bordeaux mixture or lime-sulphur, viz. when the buds begin to show colour, when the petals have fallen, and about three weeks later.

Pear Scab, like Apple Scab, is due to a fungus, in this case *Venturia pyrina.* It is cured by similar treatment.

Black Rot due to *Sphaeropsis malorum* attacks the fruit, leaves, and also the twigs and branches, producing canker. All cankered parts must be cut out or scraped and painted over with Bordeaux paste. Remove mummified fruit and burn all prunings. Spray with Bordeaux mixture in winter.

Valsa and *Cytospora* grow beneath the bark and are not reached by spraying. Dead twigs should be pruned severely.

A certain amount of damage may be done by lime-sulphur or Bordeaux mixture spray. The damage to fruit by frost is often attributed to a fungus, *Coniothyrium.* Apple leaf blotch, Mosaic disease, and chlorosis may be due to absence of iron in the soil or lack of phosphates.—*S. E. W.*

Apple, Eye-rot of. By E. S. Salmon and H. Wormald (*Gard. Chron.* Nov. 6, 1915; p. 289; 2 figs.).—An apparently new fungus disease, somewhat like brown rot, but always commencing at the eye. Noticed in three different districts. Possibly due to *Fusarium putrefaciens*. It is important, should it spread, to pick off and burn all affected fruit, and by insecticides to keep trees free from insects likely to puncture the fruit.—*E. A. B.*

Apples and Pears, Insect Pests of. By W. B. Gurney (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 303–312; 2 plates).—Thrips in orchards are dealt with by ploughing in green manure, weeds, and dead matted grass. The ground should be ploughed as close to the trees as possible. Just before the buds begin to swell, spray with lime-sulphur wash, and use a tobacco wash as the buds are opening. A solution of benzol (½ oz.), soft soap (2 oz.), in 2 gallons of water is very effective and does not damage the most delicate blooms.

To destroy San José Scale (*Aspidiotus perniciosus*), spray with dilute lime-sulphur wash ten days before the buds burst, or red oil emulsion may be used. Nursery stock should be exposed to hydrocyanic gas for forty minutes. Mussel Scale (*Mytilapsis pomorum*) is removed by spraying with lime-sulphur wash or red oil emulsion in midwinter. The adult Apple Root Borer (*Leptops hopei*) feeds on the leaves and buds of the tree, and lays her eggs on a leaf which she has previously folded over. The grubs fall to the ground and burrow down to the roots on which they feed. The adult beetles may be collected by hand or by shaking the tree over a sheet. The grubs are destroyed on the leaves by spraying with lead arseniate, but it is also necessary to lay bare the roots of trees and collect the buried grubs. The Pear and Cherry Slug (*Sclandria cerasi*) is eliminated by dusting the foliage with lime, tobacco dust, or hellebore, or by spraying with lead arsenate. When a tree is attacked by the Shot-hole Borer (*Xyleborus solidus*) cut out and burn infested wood and dead limbs. Stimulate the growth of the trees by suitable fertilizers. Paint or spray the branches with a mixture of soft soap, 1 pint of crude carbolic acid, and 15 or 20 gallons of water. Red Spider (*Bryobia pratensis*) increases in dry weather; it is easily destroyed by lime-sulphur wash or red oil spray in winter or early spring. The grubs of the Brown Apple Moth (*Cacaecia responsiva*) eat into the fruit like the Codling Moth grubs, and may be destroyed by the same methods. Pear-leaf Blister Mite (*Phytoptus pyri*) is checked by spraying with kerosene emulsion (1 in 10), red oil emulsion, or lime-sulphur wash as the last leaves fall before winter, and if necessary treat with lime-sulphur wash before the leaf-buds open in spring. The Pear and Cherry Tree Borer (*Cryptophaga*) in the grub stage bores holes from 2 to 6 inches deep in the trees. The grubs are killed by poking a wire in the holes or by squirting kerosene into the bores.

The only way to get rid of the Fruit Fly (*Ceratitis capitata*) is by burning the infested fruit and turning up the soil around the trees. The Painted Acacia Moth (*Teia anartoides*) is kept in check by collecting the cocoons or spraying with lead arsenate. Hand-picking and spraying with lead arsenate are the best means of dealing with the Emperor Gum Moth (*Antheroea eucalypti*) and the Grey-streaked Climbing Cut-worm (*Prodenia littoralis*).—*S. E. W.*

Apples, Late. By C. Maheut (*Le Jard.* vol. xxviii. pp. 172, 173).—'La Rochelle,' 'Teint Frais,' and 'La Grand'mère' are grown in enormous quantities in France, and are highly valued for their large size, good quality, and especially for the fact that they travel well and keep till the beginning of June. 'La Rochelle,' also known as 'Reinette Clochard,' comes from the west of France; 'Teint Frais' is grown in large quantities in Finistère, and 'La Grand'mère' is grown in the Angers district.—*S. E. W.*

Aristolochia longicaudata (*Bot. Mag.* tab. 8613).—Tropical South America. Family *Aristolochiaceae*. Herb, perennial, climbing. Leaves ovate, 4½ in. long. Flowers solitary. Perianth pale cream, with brown streaks or reticulations, basal portion curved and inflated, lobes narrowed to about 8 in. long, spirally twisted.—*G. H.*

Artichoke, Globe, Enemies of the. By A.-E. de Mezières (*Rev. Hort. d'Alg.* No. 12, Dec. 1913, p. 445; figs.).—The Globe Artichoke is the object of intensive cultivation on an important scale in the three Algerian departments. This article gives a descriptive list of the various insect pests which cultivators have to reckon with.—*M. L. H.*

Bags, Mouse-proof. By G. Gow (*Agr. Gaz. N.S.W.* vol. xxvi. p. 28).—Mice will not touch seed- or wheat-bags if they are rubbed over with sulphur.
S. E. W.

Basket Willow Culture. By G. N. Lamb (*U.S.A. Dep. Agr., Bull.* 622, p. 34; 24 figs.)—Willows are propagated from cuttings, taken from one- or two-year-old shoots about six weeks before they are required for planting. The cuttings are from a foot to 18 inches long, with smooth ends at right angles to the axis of the rod. They are stored in an upright position in moist sand in a cellar with an even temperature. Early spring is the best time for planting. A loose sandy loam with a uniform supply of moisture is the ideal condition. Holes to receive the cuttings are made with a stake or rod. The cuttings should not protrude more than two inches above the surface of the soil. The ground must be kept free from weeds. After the willows are cut they must be kept in water until they are peeled. Steam peeling yields a second-class article.
S. E. W.

Bean, Jack. By E. Cheel (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 391–394; 1 plate).—In warm districts the Jack or Sword Bean (*Canavalia ensiformis*) may be grown as a substitute for Broad Beans. It is a good cropper and is not attacked by insects. It is valuable as fodder.—*S. E. W.*

Beans, Oriental. By C. V. Piper and W. J. Morse (*U.S.A. Dep. Agr., Bull.* 119, pp. 32; 7 plates).—The adsuki bean (*Phaseolus angularis*) is extensively cultivated in Japan for human food. It is an annual requiring the same conditions of climate as the common bean, and is self-fertile. The bean grinds easily, and the delicate flavour of the flour makes it suitable for cakes, confectionery, and soup. The mung bean (*P. aureus*), the rice bean (*P. calcaratus*), the urd (*P. Mungo*), and the moth bean (*P. aconitifolius*), like the cowpea, require hot summer weather for development, and are not recommended for cultivation in the United States.—*S. E. W.*

Bee Diseases, Destruction of Germs of Infectious, by Heating. By G. F. White, M.D., Ph.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 92, May 1914; 3 tables).—Contains an account of experiments made to determine the minimum temperatures that can be used for destroying the germs of the four bee diseases now known to be infectious.—*V. G. J.*

Blackberries, Eradication of. (*Agr. Gaz. N.S.W.* vol. xxvi. p. 85.)—Blackberries may be destroyed by cutting back the plants and spraying with a solution of 1 lb. of sodium arsenite in 5 gallons of water.—*S. E. W.*

Cabbage Maggot, In Relation to the growth of Early Cabbage, The. By W. J. Schoene (*U.S.A. Dep. Agr., New York Agr. Exp. Stn., Bull.* 382, April 1914; 6 plates, 5 figs.).—Considering the safeness to the plant, the ease of application, cost, and protection from the maggot, the use of tar pads seems to be the most practical method yet devised for protecting early cabbage from this insect.

These pads are cut in the shape of a hexagon from roofing paper known as "single-ply tarred felt" with a slit running up to the centre. Slip the pad around the plant after it is set, and see that it fits snugly round the stem. The pad should then be pressed down firmly, so that the under-surface will be in contact with the soil.—*V. G. J.*

Campanulas, Smaller, for the Rock Garden. By M. Hornibrook (*Irish Gard.* x. p. 170; Nov. 1915).—This is the first article of a series on this charming group, and deals with the numerous forms of *Campanula rotundifolia* and its allies, *C. garganica* and allies, *C. abietina* and *C. Stevenii*, *C. pusilla* and allies, and *C. excisa*. The last seems very intractable, and the author recommends replanting it in fresh soil immediately after flowering.—*F. J. C.*

Campanulas for the Rock Garden. By M. Hornibrook (*Irish Gard.* x. p. 182; Dec. 1915).—Continuation of article, dealing with dwarf campanulas, including *Campanula isophylla* and *C. Mayi*, *C. muralis* and its varieties, *C. alpina* and its forms, *C. barbata*, *C. moesiaca*, *C. orbelicar*, *C. bellidifolia*, *C. tridentata*, *C. Saxifraga* and variety, *C. mirabilis*, and other forms suitable for the rock garden.—*F. J. C.*

Campanulas for the Rock Garden. By M. Hornibrook (*Irish Gard.* xi. p. 4; Jan. 1916).—Useful notes on *Campanula petraea*, *C. pulla* and its forms, *C. Raineri*, *C. Raddeana*, *C. rhomboidalis* and its forms, *C. Saxifraga*, *C. tridentata*, *C. bellidifolia*, *C. alpina*, *C. Aucheri*, *C. thyrsoidea*, *C. tyrolensis*, *C. punctata*,

C. collina, C. Zoysii, C. crenulata, C. trichopoda, C. chinensis, C. Balfouriana, C. Morreliana, and various hybrids.—*F. J. C.*

Capsid Bugs. J. C. F. Fryer, M.A. (*Jour. Bd. Agr.* xxii. No. 10, Jan. 1916; 4 figs.).—A long and valuable paper giving a summary of our knowledge of the injury to apple trees and fruit generally ascribed to plant bugs of the family Capsidae. The insects puncture the young leaves, causing first scattered red or brown spots, while later, owing to the death of the punctured areas, only an undersized and ragged leaf is left. The shoots are stunted, and the fruit is injured in various ways. In mild cases it is deformed owing to parts failing to develop, while other parts are stimulated abnormally, causing scattered pits and pimples. In severe cases the apple is almost shapeless; cracks appear, sometimes penetrating to the core; the surface is often rough and corky, and the flesh underneath shrivelled. Many of the fruits fall off at an early stage, but even then it is not uncommon for from 20 to 30 per cent. of the mature fruit to be useless.

The varieties of apples attacked are mentioned, and experiments to determine the insects responsible are described. A full account of the life-history of *Plesiocoris rugicollis* is given, with references to *Orthotylus marginalis*, which has a similar history, these being the two green bugs which probably cause most of the damage.—*G. C. G.*

Carex physodes. By E. Gadeceau (*Le Jard.* vol. xxix. pp. 287, 288; 1 fig.)—*Carex physodes* is an attractive curiosity for the alpine garden. It is a native of the sandy steppes of the Transcaspian, and of the deserts of Afghanistan and Turkestan, where it is exposed to extremes of temperature. The plant is remarkable for its reddish-brown seed-vessels.—*S. E. W.*

Carnations, Rust. By A. Rolet (*Le Jard.* vol. xxix. pp. 266, 267).—The rust of carnations is a difficult disease to contend with. It is favoured by a warm, damp state of the atmosphere, excessive moisture in the soil, and by the use of nitrogenous manure. The tissues are rendered more resistant to the attacks of the fungus by the addition of potash, lime, and phosphates to the soil. Plants attacked by rust should be burnt. As a preventive, spray with one of the following solutions towards the end of September: Bordeaux mixture, potassium permanganate, 1 in 1,000; or potassium sulphide, 5 in 1,000.
S. E. W.

Cellulose, The Destruction of, by Bacteria and Filamentous Fungi. By I. G. McBeth and F. M. Scales (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 266).—Cellulose-destroying bacteria and moulds occur in all cultivated soils. Thermophilic bacteria, which are also present, are extremely active agents under favourable temperature conditions such as occur in fermenting manure heaps, but they soon lose their power of destroying cellulose in artificial media.

The authors of this bulletin isolated fifteen distinct species of bacteria, which proved to be different both morphologically and physiologically from the hydrogen and methane ferments described by Omelianski.

Five of the above-mentioned species of bacteria are fully described and figured, including *Bacillus cytaseus*. The principal products by some species consist of the lower fatty acids; with other species only traces of the fatty acids occur. No aldehydes, ketones, alcohols, or reducing sugars were produced by the species examined. In artificial media, in the case of bacteria, it was found, with few exceptions, that the sugars, starch, and higher alcohols were broken down with the production or more or less acid.

The authors consider that filamentous fungi play a much more active rôle in the destruction of cellulose than is generally recognized. The cellulose-destroying moulds act differently towards different kinds of cellulose. To give one instance, *Penicillium africanum* and *P. pinophilum* will dissolve precipitated cellulose actively, but will not attack rye straw, cherry wood, or cedar shavings. Several forms of *Aspergillus*, which are also active cellulose-destroyers, behave in the same way.

An historical review of previous investigations of the destruction of cellulose is given, also a good bibliography of numerous papers, but the subject is one of extreme complexity, and still requires a prodigious amount of careful scientific investigation.—*D. M. C.*

Cereus peruvianus. By L. Pichenaud (*Le Jard.* vol. xxviii. p. 233; 1 fig.).—A fine specimen of *Cereus peruvianus* growing in the open air may be seen at the Villa Antoinette at Cannet, near Cannes. It has reached a height of 30 feet, flowers every year in June and July, and sometimes in September.—*S. E. W.*

Chrysanthemums (*Jour. Soc. Nat. Hort. Fr.* Dec. 1913, p. 792).—The Chrysanthemum section of the society publishes its yearly list of the best existing varieties of chrysanthemum, divided into fifteen groups.

1. The easiest grown big-flowered kinds.
2. Late large-flowered varieties.
3. Best very large-flowered varieties.
4. Best dwarf varieties.
5. Best varieties for standards.
6. The latest varieties.
7. Varieties remarkable for form or colour.
8. Best varieties for succession.
9. Downy-flowered varieties.
10. Striped varieties.
11. Star-shaped varieties.
12. Best long-stemmed varieties to grow in the open.
13. Varieties to plant in the open.
14. Hardiest varieties.
15. Best single-flowered varieties.—*M. L. H.*

Cirrhopetalum Fletcherianum (*Bot. Mag.* tab. 8600).—New Guinea. Family *Orchidaceae.* Tribe *Epidendreae.* Herb of considerable size, epiphytic. Pseudo-bulb close-set, sub-globose, with a single leaf. Leaf 2–14 in. long. Scapes 5–7 flowered. Flowers very large, blotched with purple. Sepals acuminate, 2¾ in. long. Petals ovate, with an acuminate tip, 1 in. long. Lip clawed.—*G. H.*

Clematis uncinata forma **retusa** (*Bot. Mag.* tab. 8633).—China. Family *Ranunculaceae.* Tribe *Clematideae.* Shrub, climbing. Leaves proximately 5–7-foliate; leaflets elliptic, 2½ in. long. Flowers 1½ in. across. Sepals white.—*G. H.*

Coccidae of Australia (continued). By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 411–423, 511–516; 7 figs.).—The following Scale Insects occur in Australia; *Ceronema banksiae, C. dryandrae, Pulvernaria dodonaea, P. flavicans, P. floccifera, P. maskelli, P. nuitsiae, P. paradelpha, P. salicorniae, P. tecta, P. Thompsoni, Lichtensia hakearum, Signoretia luzulae, Ceroplastes ceriferus, C. floridensis, C. rubens, Ctenochiton araucariae, C. cellulosus, C. eucalypti, C. rhizophorae, Inglisia foraminifer, I. fossilis,* and *Ceroplastoides melaleucae.*

Many new species were also discovered, viz.:—*Ceronema caudata,* found on the foliage of *Eucalyptus robusta,* differs from *C. banksiae* by having a curled tail 0·33 inch long. The covering of the male is oval, white with a yellowish tint. The adult female is reddish brown, lighter at the margins. *Pulvernaria contexta* lives on the twigs of *Bossiaea* and *Dillwynia contexta.* The length of the female and ovisac is ¼ of an inch. It has slender legs and antennæ, and is coloured brown. The male is under 0·1 inch in length. *P. darwiniensis*; the female is dull yellow with white ovisac, length 0·1, with ovisac 0·2 inch. *P. greeni* infests *Myoporum deserti.* The female with ovisac measures 0·2 inch; it is wrinkled, yellow brown mottled with reddish brown, and the ovisac is white. The male puparium is 0·1 inch long. *P. newmani* is found on the twigs of *Jacksonia.* The surface of the female is covered with spines; with ovisac it is ½ an inch long. *P. theae* is found on the leaves of *Thea viridis.* The yellow-brown female is 0·125 inch long. The white ovisac is ¼ an inch long. The legs and antennae are indistinct. *Tectopulvinaria loranthi* exists on *Eucalyptus* and *Loranthus.* The female is hidden by the white ovisac. It is elongate, oval, convex, and measures 0·33 inch with ovisac. The light yellow larva is hidden under the female in a mass of woolly particles. *Ctenochiton serrata,* found on the leaves of an Acacia, is a beautiful species. The female is reddish brown, flattened, elongate, oval with a slight dorsal stripe; length ⅟₇ inch; dorsal surface covered with angular plates of wax. The male test is shaped like a slipper. *C. transparens* is also found on an Acacia. The adult female is enveloped in an oval mass of pale yellow wax; it has short, stout antennæ and small legs.—*S. E. W.*

Codling Moth Parasite (*U.S.A. St. Com. Hort., Cal. Bull.,* vol. iii. No. 5, May 1914; 14 figs.).—The Calliephialtes parasite of the codling moth was introduced into California from Spain in 1904, and was distributed in large numbers throughout the State.

On account of the wide differences in handling the apple crop in California and in Spain, the physical limitations of the parasite, and the fact that the codling moth larvæ hibernate, the author of the paper considers that *Calliephialtes* sp. will be of little, if any, practical use.—*V. G. J.*

Colour Chemistry of Flowers. (1) By A. E. Everest; (2) by M. Wheldale (*Jour. Gen.* iv. pp. 361–376).—Two papers upon the anthocyanin colours of flowers. The authors of the two papers do not appear to be in agreement as to the interpretation of the results obtained.—*F. J. C.*

Conifers, Notes on. By A. Bruce Jackson (*Gard. Chron.* 1915–16).—A continuation of critical notes with figures. The following are dealt with: *Cupressus Lawsoniana*, Oct. 30, p. 272, with 3 figs.; *C. nootkatensis*, Dec. 18, p. 374, 2 figs.; *C. pisifera*, Jan. 29, p. 58, 1 fig.—*E. A. B.*

Conifers, Pacific Coast, Insect Damage to the Cones and Seeds of. By John M. Miller (*U.S.A. Dep. Agr., Bull.* 95, July 9, 1914).—*Character and Cause of Damage.*—Damage to the seed of conifers is caused by various species of insects which feed upon the buds, flowers, immature cones and seed, and mature seed. Great damage is accomplished while the cones are immature and before the seed ripens. Cones which are infested or "wormy" are often found when the areas for seed collection are being located. Wormy cones and seeds are caused by the adults and grubs of small beetles, the "worms" or caterpillars of moths, the maggots of gnats, and the larvæ of tiny wasps known as seed chalcidids. With the exception of the cone beetles, the adult insect is seldom found in the immature cone. The insects may be found in almost any part of the cone or seed, the feeding habits varying much with the different species. In many cases the presence of these insects in the cone is evident, and may be recognised by the peculiar type or class of injury. Where this is the case the damage may be approximately estimated in the summer.

Indications of Insect damage.—Attacks of the cone beetle in the seed crop are indicated by a small entrance-hole at the base of the cone, with castings or small pitch tubes, during the early summer; later, by the brown, withered appearance of the cone.

The attacks of the cone moth may sometimes be recognized by little masses of pitch and larval castings on the surface of the cone, and sometimes by withered cones, but it is best to look for the caterpillar among the scales and in the seed and pith. It is always best to cut the cone open, sectioning it several different ways, in making the examination.

The attacks of the fir-cone maggot can also be found by cutting or breaking the cone open. The larval mines will be found in the scales and seeds, in which will usually be found the small, white, active larvæ.

An intelligent selection of the seed-collecting areas will prevent much of the loss due to gathering seed which is afterwards found to be infested or worthless. *A. D. W.*

Copper Carbonate as a Fungicide. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 242, 243).—Instead of pickling wheat seed in copper sulphate solution, shaking the seed up with powdered copper carbonate is equally efficient as a fungicide.—*S. E. W.*

Corylus mandshurica (*Bot. Mag.* tab. 8623).—Eastern Asia. Family *Cupuliferae*. Tribe *Coryleae*. Shrub, 15 ft. in height. Leaves sub-orbicular, 2½–6 in. long, double-serrate. Male catkins 1–3 together. Involucre closely investing the nut, globular at the base, but produced into a tube, 2 in. long, hispid, not depressed, globose, ½ in. wide.—*G. H.*

Cotoneaster pannosa (*Bot. Mag.* tab. 8594).—Western China. Family *Rosaceae*. Tribe *Pomaceae*. Shrub with deciduous foliage, 8 ft. high. Leaves ovate, ⅓–1¼ in. long, dull green. Corymbs, 1–1¼ in. wide. Corolla ⅜ in. across, white. Fruit oval, ¼ in. long, deep red.—*G. H.*

Cotton Wilt and Root-knot. By W. W. Gilbert (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farmers' Bull.* 625, Dec. 1914, pp. 1-24; 15 figs.).—Both cotton wilt and root-knot occur in all the cotton-producing States from North Carolina to Texas; the first is particularly prevalent in South Carolina, Georgia, and Alabama, while the root-knot is rather more generally distributed in the same areas.

Cotton Wilt is caused by the fungus *Fusarium vasinfectum* Atk. This, entering the roots of the plant from the soil, passes into the vascular tissue, especially the wood vessels, and, growing vigorously, prevents the ascent of water to the stem. This soon causes the plant to wither and finally die. The fungus produces a variety of spores, including macroconidia, microconidia, and chlamydospores. Fusarium causes similar wilting in tomato, potato, water-melon, cowpea, &c.

As a rule, this disease occurs on soils of a sandy or sandy-loam nature, seldom on clay soils, and appears to be favoured by abundant soil moisture.

The only effective control is the cultivation of wilt-resistant varieties, such as 'Dillon,' 'Dixie,' 'Modella,' 'Sam Wood,' &c.

Root-knot is caused by the attacks of eelworms. These enter the root and cause galls to form. The attack is more prevalent on sandy than on clay soils. To control this pest, systematic rotation of crops is recommended.—*A. B.*

Cranberry Toad-bug, The. By F. A. Sirrine and B. B. Fulton (*U.S.A. Dep. Agr., New York Agr. Exp. Stn., Bull.* 377, March 1914; 8 plates, 2 charts, 4 figs.).—Cranberry growers on Long Island have been troubled by a peculiar dying of the new growth of the vines, caused by the Cranberry toad-bug (*Phylloscelis atra* Germ.), of the family of Fulgoridae.

Flooding and spraying are the two methods of control, the former being the best when practicable.—*V. G. J.*

Cymbidium × Pauwelsii (*Le Jard.* vol. xxviii. p. 181; 2 figs.).—*Cymbidium* × *Pauwelsii* was obtained in 1908 by crossing *C. Lowianum* ♂ with *C. insigne* ♀. The hybrids began to flower regularly in 1913, each plant producing four or five stems, each bearing about 30 flowers. Most of the flowers are pale yellow with a crimson labellum, but some are white or yellow. It is of easy cultivation in the cool or temperate house. It flowers from December to May.—*S. E. W.*

Dasheen. By R. A. Young (*U.S.A. Dep. Agr.*, 17 pp.; 4 plates).—The Dasheen, an Aroid, is cultivated with success in Florida and South Carolina in rich, moist, sandy soil. It has large shield-shaped leaves like a Caladium. The leaves and the rind of the tubers contain an acrid ingredient which attacks the skin. The action is neutralized by soda. The corms ripen in October and are not damaged by a wet season. They contain a larger proportion of carbohydrates and protein than the potato. They may be baked or converted into flour. The blanched shoots serve as a substitute for asparagus, and the young leaves for spinach.—*S. E. W.*

Dorstenia zambuzaensis (*Bot. Mag.* tab. 8616).—Belgian Congo. Family *Urticaceae.* Tribe *Moreae.* Herb, stems erect, 1–1½ ft. high. Leaves elliptic-lanceolate, 3–6 in. long, glabrous. Receptacles angularly orbicular, disk ⅝–¾ in. across, narrowly winged with a marginal fringe.—*G. H.*

Echium Perezii (*Bot. Mag.* tab. 8617).—Island of Palma. Family *Boraginaceae.* Tribe *Boragineae.* Herb, tall and erect, 2 ft. high. Leaves deflexed, linear, 5 in. long. Thyrse terminal, ovoid, many-flowered. Corolla funnel-shaped with regular limb ½ in. across, pale pink or rose. Stamens exserted (not declinate).—*G. H.*

Echiums and Statices (*Rev. Hort. d'Alg.* No. 12, Dec. 1913, p. 464).—The plants which are the objects of this notice are justly considered as the marvels of the rich vegetation of the Canaries. Although belonging to two genera represented by a certain number of species in the French Flora, the humble Viperines and modest Statices of Europe give no idea of the splendour of their kindred in the Fortunate Isles.

The species found in the Canaries and their culture are described in this article.—*M. L. H.*

Electric Niagaras. By A. Beckerich (*Le Jard.* vol. xxviii. pp. 203–205, xxix. pp. 272, 273, 281–283, 290–292; 5 figs.).—Assuming that hailstorms are due to the difference of potential in the negative electricity in the earth and the positive in the clouds, attempts have been made to protect the crops from damage from hail and thunder-storms by means of "Electric Niagaras." The Niagara is a conductor of electricity consisting of a band of electrolytic copper 3½ inches wide, ·07 inch thick, and about 43 yards high. The lower end terminates in a conductor with branching arms buried in moist earth. The upper end, supported in the air, terminates in a number of sharp points, and should be not less than 11 yards higher than any object in the immediate neighbourhood. The idea is that a continuous flow of negative electricity passes through the conductor from the earth to the clouds, neutralizing the positive electricity and reducing the potential. Under these conditions the number of thunder-storms is reduced, their severity diminished, and what little hail falls reaches the earth in a soft state and does little damage to the crops. Further observations on the efficacy of the Niagaras is desirable.—*S. E. W.*

Electricity, Influence of, on Plants. By M. Pinelle (*Jour. Soc. Nat. Hort. Fr.* Jan. 1915, p. 12).—The Abbé Meuley suggests, as the explanation of experiences he has had in his own garden, that the near neighbourhood of high electric currents may be injurious to vegetation.—*M. L. H.*

Encephalartos Hildebrandtii (*Bot. Mag.* tab. 8592, 8593).—East Africa. Family *Cycadaceae*. Tribe *Encephalarteae*. Tree, to 20 ft. in height, 1 ft. in diam. Leaves 9 ft. by 1 ft., pinnae 50–70. Male cone cylindric, 8–18 in. long, brick-red; female cone 2 ft. long and 7 in. thick, leather-yellow. Seeds vermilion, 1¼ in. long.—*G. H.*

Eugenia uniflora (*Bot. Mag.* tab. 8599).—Tropical South America. Family *Myrtaceae*. Shrub or small tree. Leaves opposite, ovate-elliptic, 2½ in. long. Flowers solitary. Petals 4, white, ¼ in. long. Fruit sub-spherical, 1–1¼ in. diam. deeply furrowed, red.—*G. H.*

Fasciation. By M. A. Brannon (*Bot. Gaz.* vol. lviii. p. 518; 5 figs.).—This paper describes a case where many fasciated sprouts arose from cut stems of cottonwoods and willows in 1888. The flattening was particularly marked near the outer extremities of the stems, and was accompanied by profuse branching and forking of the fasciated specimen. Henslow found this to be characteristic of the vascular bundles of the fasciated stems of herbs ("Fasciation and Allied Phenomena," *Jour. R. Hort. Soc.* xxvi.). The present case appears to establish the cause, namely, an excess of sap: "Root pressure of the cottonwood and willow tree-stumps was in full operation during the early spring months after the trees had been cut away." "Hus states that fasciation may be produced experimentally in animals by providing like conditions; for fasciation follows cutting the stems of seedlings just above the cotyledons; while roots will be fasciated if the tops were amputated."

Similarly indefinite inflorescences may be replaced by fasciated stems: "About the time of the appearance of the first flowers, the plant is kept as dry as possible. If now it be daily abundantly watered, occasionally with manure water, numerous fasciations will make their appearance." One infers, therefore, that a superabundance of water and nourishment can only be dealt with by increasing the number of vascular bundles by repeated forking, and, in the case of flowers, supernumerary petals &c. forming.—*G. H.*

Feijoa Sellowiana (*Rev. Hort. d'Alg.*, No. 12, Dec. 1913, p. 459).—*Feijoa Sellowiana* is a native of the Andes, belongs to the Myrtle family, and has been made by Dr. Vidal to fruit in Northern France. The fruit, which is known in Brazil by the name of "Araçaz," did not fully ripen, but the experiment was tried in a specially unfavourable summer, and it is considered that with time and as the result of selection a valuable new fruit may be produced, suitable to European conditions.—*M. L. H.*

Field Mice. By D. E. Lantz (*U.S.A. Dep. Agr., Bull.* 670, p. 10; 7 figs.).—Field mice may be caught in guillotine traps or poisoned with crushed oats dusted over with a mixture of strychnine (1 oz.), sodium bicarbonate (1 oz.), and ⅛ oz. saccharine.—*S. E. W.*

Forest Planting in the Eastern United States. By C. R. Tillotson (*U.S.A. Dep. Agr., Bull.* 153, January 28, 1915).—The 1910 census shows that the average farm in the United States contains 138 acres, of which 75 are recorded as improved and 63 as unimproved, the latter consisting of "woodland" and "all other unimproved land." The woodland and other unimproved land covers the enormous total area of 400,346,000 acres. Of this nearly 245,000,000 acres are in the States east of Texas and the Rocky Mountains, about 175,000,000 acres of which are in wood-lots. There remain about 70,000,000 acres of unforested and unimproved land in this eastern portion of the country, most of it best suited for growing timber. This area will be reduced by draining the swamp lands potentially adapted to agricultural crops, but will be increased by the addition of lands becoming worn out and unfit for growing field crops.

Within the past five or ten years, however, forest planting has received a stimulus through the activities of State forest officers, and also through the distribution by some of the States, either free or at cost, of forest-tree seedlings raised in State nurseries. By 1910 Ohio had distributed more than 1,000,000 of such seedlings, and in 1907 and 1908 Michigan distributed 396,000. Indiana and Michigan have State demonstration areas where different species are planted experimentally.

As the old plantations are cut and the need is felt for new windbreaks to take their place, trees will be planted for this purpose. White pine, Norway spruce, and white spruce are likely to be the favourite species. There will be some planting to provide shade for stock and to grow fence posts and other products for use on the farm. Such plantations, however, will be restricted to the less valuable land, and their extent will depend very largely on the success of those

already established. In some of the more newly settled districts, as yet practically treeless, planting of the rapid-growing hardwoods is still going on, and will probably continue for some time.

Scots pine will grow in all sections of the eastern United States, and is well adapted for sandy soils too poor for agriculture or even for the growth of white pine. The tree seems to do equally well on the sandy Norway pine lands of Michigan, and on old worn-out lands of New England. For the first fifteen or twenty years Scots pine makes very rapid height-growth, often from twenty to thirty inches a year.

In spite of its hardiness and freedom from disease, it is to be regretted that the Scots pine already planted consists largely of a variety from central Germany, the trees of which, when about twenty years old, become crooked, irregular, ragged, and of very poor timber form, yielding only one or two logs a tree. In Europe, on the other hand, trees grown from seed collected in the Scots pine forests of the Baltic provinces of Russia, ordinarily called the Riga variety, have straight, cylindrical, well-developed trunks, and yield wood of a higher quality than the Scots pine of central Germany. Unless, therefore, the Riga variety can be secured, the planting of Scots pine is not recommended.

A. D. W.

Fruit, Brown Rot of. By D. M. Cayley (*Gard. Chron.* Oct. 30, 1915, p. 269; 2 figs.).—Due to *Sclerotinia fructigena*, better known in the conidial stage as *Monilia fructigena*. Emphasizes the importance of burning rotten or mummified apples and pears attacked by this fungus, and burning them. Spurs are attacked by the mycelium passing down the fruit stalk. A Bordeaux spray in early spring is recommended.—*E. A. B.*

Fruit Trees, Enemies of. By A.-E. de Mezières (*Rev. Hort. d'Alg.* No. 10, Oct. 1913, p. 357, and No. 11, Nov. 1913, p. 405; figs.).—Two illustrated and descriptive articles on the various diseases and insect pests to which fruit trees are liable. After describing the various pests the articles give formulas of remedies and preventives, classified as—first, direct destruction—*i.e.* collection by trap or handpicking of the insect itself; second, destruction by treatment with chemicals, applied either liquid or as a gas; and lastly, on the destruction of buried larvæ.—*M. L. H.*

Fruit Trees, Forms of. By H. E. Durham (*Gard. Chron.* Nov. 13, Dec. 11, 14, and 18, 1915; pp. 305, 346, 366, 367, and 377; 5 figs.).—Deals with the training of young trees under the heads: 1. Means of Modelling. 2. General Principles. 3. The Dwarf Standard, Pyramid, and Distaff. 4. Forms trained in the flat for Spalier and Counterspalier.—*E. A. B.*

Fruit-tree Stocks. By U. P. Hedrick (*U.S.A. St. Com. Hort., Cal.* Nov. 1914, vol. iii. No. 11; 8 figs.).—The author's opinion is that the stock greatly influences the scion in more ways than in modifying the form and stature of the plant, and assuring its adaptability to varying conditions of soil and climate. He concludes his paper with these words: "The stock modifies the stature of plants; suits them to the soil and climate; influences fruitfulness; changes the time of maturity, size, colour, and flavour of fruit; and affects the length of life of the trees. The stock, too, is influenced by the scion. The method of growing the stock, whether from cuttings or seeds, is important. The effects of the stock on the scion, appreciable though they are, do not change the identity of a variety, and are not heritable. Fruit-growers and nurserymen must give the question of stocks much more careful thought; we shall thus secure more fruitful orchards."

This bulletin also contains an article on almond cultivation, by G. W. Pierce, and a paper on Fall treatment for apple aphis, by O. E. Bremner, who recommends spraying with crude oil emulsion or whale-oil soap solution between November 15 and 25, thus destroying the sexual female before eggs are laid.—*V. G. J.*

Fruits, Tropical, on the Riviera. By Dr. A. Robertson Proschowsky (*Rev. Hort. d'Alg.*, No. 1, Jan. 1914, p. 6).—Some experiments have been undertaken with the view of determining the comparative adaptability of certain tropical fruits to the climate of the Riviera. They were carried on in a garden in which the conditions were less favourable than could be found in many parts of the region, and even with this disadvantage gave distinctly encouraging results.—*M. L. H.*

Gentiana barbata forma **grandiflora** (*Bot. Mag.* tab. 8609).—Liberia. Family *Gentianeae*. Tribe *Swertieae*. Herb, annual, erect or ascending. Leaves linear-lanceolate, 2½ in. long, ⅛ in. wide. Corolla 2½–3 in. long; lobes, 4, 3 in. across from petal tips, blue.—*G. H.*

Gentiana gracilipes (*Bot. Mag.* tab. 8630).—China. Family *Gentianaceae.* Tribe *Swertieae.* Herb, perennial, with barren rosettes, accompanied by erect flowering stems. Leaves narrow lanceolate, up to 2 in. long. Flowers solitary in the axils of the leaves. Corolla purplish-blue, petals alternating with 5 triangular folds.—*G. H.*

Germination in Economic Seeds Delayed. By Dean H. Rose (*Bot. Gaz.* vol. lix. p. 425).—The author observes that "delayed germination and poor germination are due to one or more of the following causes: hard-coatedness, the need of after-ripening, exclusion of oxygen by the seed-coat, the effect of frost on seeds, fungi on or in seeds." Each of these is considered in detail with the experiments, with the following summary:—

1. Hard-coated seeds of legumes and seeds of Delphinium, Ipomoea, &c., can be forced to more rapid germination by being blown against needle-points.

2. For two varieties of lettuce, the seed improves in viability as it grows older, up to the end of at least the fourth year. This improvement is probably due to increased permeability of the inner seed-coat to water.

3. Cold storage in wet sand increased the germination of seed of *Pinus Strobus* and *Cupressus macrocarpa.* Delayed germination seems to be due to lack of water. Any kind of soaking or injection gave 13–38 per cent. better germination than was obtained with the controls.

4. Certain samples of frosted oats improve in germinating power as they grow older, others deteriorate.

5. Certain late varieties of Western-grown garden peas germinate poorly because of (*a*) frost injury to the embryo, (*b*) presence of fungi.

6. Seeds of 51·4 per cent. of all species and varieties examined showed fungi on the seed-coat within two days after being put to germinate.—*G. H.*

Gladiolus, A Disease of. By M. Foëx (*Jour. Soc. Nat. Hort. Fr.*, Feb. 1915, p. 28).—A disease among Gladiolus bulbs, which appears first as brown spots on the outside and eventually affects and hardens the internal tissues, has been studied and is proved to be caused by a *Fusarium.* So far the appropriate cure has not been discovered.—*M. L. H.*

Gladiolus Melleri (*Bot. Mag.* tab. 8626).—Tropical Africa. Family *Iridaceae.* Tribe *Irideae.* Herb. Leaves few, linear, 1 ft. long. Scape 2 ft. high. Perianth red. Anthers yellow.—*G. H.*

Gladiolus, The Florist's. By A. J. Bliss (*Gard. Chron.* Jan. 8, 15, 22, 1916; pp. 25, 31, and 53; 1 fig.).—Describes clearly the change in form and position from the normal zygomorphic hooded flower with three marked segments, to the semi-peloriate or Florist's form, in which five of the segments are large and nearly equal in size and only one smaller and blotched. Besides these extremes the writer describes the Reversion form, with the three inner segments identical in size and marked with the blotch, and the Actinomorphic or lily-shaped form, with all six segments large and unmarked. In the Florist's form, by means of a twist of 30° in the perianth tube, the lower inner segment that is farthest from the stem is brought into the lowest place. This is also the only segment that retains the blotch.—*E. A. B.*

Goat Moth (*U.S.A. St. Com. Hort., Cal. Bull.*, vol. iii. No. 7, July 1914; 12 figs.).—The Carpenter Worm (*Prionoxystus robiniae*) is better known, perhaps, as the goat moth. Oaks, poplars, willows, locust, and elms are in many localities attacked and greatly damaged by this pest.

"To reach these worms in their deep burrows was a problem, and the use of carbon bisulphide was hit upon. Its use has been tried with great success in many localities."—*V. G. J.*

Goldenseal Cultivation. By W. Van Fleet (*U.S.A. Dep. Agr., Bull.* 613, pp. 1–15; 5 figs.)—Goldenseal (*Hydrastis canadensis*) is a perennial with a short yellow root-stock. It grows to a height of one foot, and bears two or three leaves and a small greenish white flower. The root-stock and rootlets are valued on account of their medicinal properties. The plant may be propagated from seed under glass or from root-buds. It requires the same conditions as ginseng but is a less difficult crop to grow.—*S. E. W.*

Grape Leaf-hopper, in the Lake Erie Valley, The. By Fred Johnson. (*U.S.A. Dep. Agr., Bur. Entom.* No. 19, January 1914; 3 plates, 13 figs.). —In nearly all discussions of the insect enemies of the grape during the past seventy-five years, the grape leaf-hopper (*Typhlocyba comes*) has been put in the front rank with the most destructive ones. Since it and its several varieties are of common occurrence in native grape vines in the wild state

almost everywhere that the grape vine is found throughout the United States and Canada, and since this species is not recorded as occurring in Europe, it is doubtless a native of America. It was first reported from Missouri in 1825, and by 1897 had become so serious a pest in California as to be placed next in destructive importance to the grape Phylloxera.

It is a sucking insect in both the nymphal and adult stages, and injures the plant by inserting its thread-like proboscis in the underside of the leaf and extracting the juices therefrom. The result of these punctures is a whitening in patches on the upper surface of the leaf, which later turns brown, and finally the leaf falls from the vine prematurely, thereby checking the development of the vine and reducing the fruit crop considerably.

Field experiments prove conclusively that this pest can be controlled by spraying against the nymphs with a tobacco extract solution.—*V. G. J.*

Gummosis. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 405–410).—The gumming of fruit trees may be due to unsuitable soil, excessive moisture, or excessive manuring. It can also be caused by certain fungi, bacteria, boring insects, frost, or unequal growth between scion and stock. The remedies are judicious pruning of the roots, application of lime to the soil, or in the case of Peach trees apply 2 lb. of salt to each tree, slit the bark spirally and remove dead bark.—*S. E. W.*

Hemlock, The Eastern. By E. H. Frothingham (*U.S.A. Dep. Agr., Bull.* 152, February 3, 1915).—In spite of its present importance, hemlock is not a tree of promise for forest planting. White and red pine will yield better lumber in a much shorter time and on poorer soils, are less susceptible to decay, and are more easily grown. Spruce serves as well for the protection of watersheds and stream sources, and produces better pulpwood and lumber. Several other species produce fully as good tan bark or extract in a shorter time. Nevertheless hemlock will undoubtedly persist in the old-growth forests and natural second-growth in many regions, and its presence in these stands may be of decided benefit to them.

Though hemlock first came into use because of the growing scarcity and increasing value of better trees, it can no longer be considered merely a substitute for these species. In the three large industries to which it contributes—lumber, pulp, and bark—it has become practically indispensable.

During the last five years hemlock has ranked fifth in importance among the lumber trees of the United States, being exceeded only by yellow pine, Douglas fir, white pine, and oak.

The durability of the wood depends very largely upon the nature of its use. In contact with the soil it is very perishable, and is not well adapted for ground-sills unless treated with a preservative. If kept in a dry place, however, it is extremely durable. Even as outside covering it will give good service if placed so that it dries out rapidly and thoroughly after being wet. There are instances of hemlock barns which still stand after fifty or more years' use. Shaved hemlock shingles, if of good, straight-grained wood, and used on a moderately steep roof, are practically as durable as white pine shingles. An important defect of hemlock for such uses is its liability to check and split when exposed to the sun. Hemlock laths are said to make a firmer and better wall than pine, though harder to nail than either the latter or basswood.

Hemlock bark has been used in tanning practically ever since the beginning of the industry in America. Oak bark is preferred, since it makes the leather softer, more pliable, and less permeable to water than does hemlock; but there is not as much of it, and for many years its annual consumption in tanning has been less than half that of hemlock.—*A. D. W.*

Hippeastrum Elwesii (*Bot. Mag.* tab. 8614).—Argentina. Family *Amaryllidaceae.* Tribe *Amarylleae.* Herb. Leaves with the flowers linear. Perianth pale yellow, tube claret-coloured within; lobes 3 in. across.—*G. H.*

Hop Male, Humulus Lupulus L., Variation in the. By H. Wormald (*Jour. Agr. Sci.* vii. Part 2, pp. 175–196, Sept. 1915; 1 plate).—Contrary to the opinion current until recently, the Male Hop Plant shows considerable variation. Salmon and Amos have shown that for the production of "well grown-out" hops a certain number of seeds is of primary importance. Hence hopgrowers have been recommended to plant a certain proportion of male plants in the hop gardens. The author points out that for the purposes of pollination the two characters of greatest commercial importance are (1) time of flowering, (2) suitability to different types of soil of the male hop plant. He has examined about eighty different plants for three seasons in regard to the two above-named characters,

and also in regard to characters of stems, leaves, and laterals. He shows that male hops exhibit definite variation in several directions, and that selection for one or more characters is quite feasible.—*J. E. W. E. H.*

Hybridization. By J. Harraca (*Le Jard.* vol. xxviii. p. 219).—The character and properties of about 30 per cent. of the progeny obtained by cross-fertilizing two varieties of wheat could not be foreseen from the appearance of the parents.

The results obtained by crossing two plants in two different years are totally different.—*S. E. W.*

Iris Urumovii (*Bot. Mag.* tab. 8608).—Bulgaria. Family *Iridaceae.* Tribe *Irideae.* Herb. Stems, several, 4–5 in. high. Leaves 5–6 to a stem, 10 in. long, ½ in. wide. Perianth, outer segments 1–1½ in. long, with bluish-purple veins in the white base. Inner segments 1 in. long, purple.—*G. H.*

Leguminosae, Development and Distribution of. By E. C. Andrews (*Bot. Gaz.* lx. p. 300).—In discussing the development and present distribution of Leguminosae, Mr. Andrews comes to the conclusion :—" The present distribution of plants and animals is the algebraic sum of the responses made by organisms to their changing environments during the whole of the known geological record, and the present adjustment of the activities involved has been obtained only after ages of development during various changes." This appears to be a special case of Darwin's alternative explanation of evolution ; viz. that new varieties arise by response to the direct action of changed conditions of life, without the aid of natural selection (*Variation of Animals and Plants, &c.*, ii. pp. 271, 272). Mr. Andrews finds that many uniform types of leguminosae are widely diffused through the tropics, and that in extra-tropical countries these uniform tropical forms are represented by specialized types which are mainly xerophytic. It may be added that in Malta leguminous plants are dominant, and all xerophytic on the characteristic limestone of that island.—*G. H.*

Lettuce, A Bacterial Disease of. By N. A. Brown (*Jour. Agr. Res.* iv. pp. 475–478 ; August 1915).—Outer leaves entirely shrivelled and dried, and some in a soft-rotted condition; centres of heads sound, but here and there leaves in them affected in varying degrees. In some places numerous separated spots with a water-soaked appearance were evident. The organism is described, and the name *Bacterium viridilividum* is proposed for it in allusion to the peculiar appearance of the organism when growing on potato.—*F. J. C.*

Lilium cernuum. By A. Grove (*Gard. Chron.* Nov. 13, 1915, p. 302 ; 2 figs.).—Records the first flowering in England of this species in Mr. Perry's Nursery in June, giving the history of the plant, list of habitats, and Komarov's later diagnosis and figures of a flowering plant and of a bulb.—*E. A. B.*

Lodgepole Pine in the Rocky Mountains, The Life-History of. By D. T. Mason (*U.S.A. Dep. Agr., Bull.* 154, January 14, 1915).—Lodgepole Pine (*Pinus contorta* Loudon) is one of the most widely distributed western conifers. The " lodgepole region "—that in which lodgepole is the pre-eminent important species —is mountainous, frequently interrupted by broad, open valleys, or plains, partly fertile and devoted to farming, and in part suitable only for grazing. The forests, as a rule, are confined to the mountains.

Lodgepole is one of the smallest of the commercially important pines. In well-developed stands approximately 140 years old, at which age the tree may be considered mature, most of the merchantable trees are from eight to fourteen inches in diameter breast-high, and from sixty to eighty feet in height. However, trees up to twenty inches in diameter and eighty-five feet in height are common.

Lodgepole pine seldom attains a very great age because of fire and insect damage. Stands over 250 years old are uncommon, and stands over 300 years very rare. The oldest stand on record is one in the Beaverhead National Forest, Montana, which has attained an age of about 450 years.—*A. D. W.*

Lotus campylocladus, forma **villosior** (*Bot. Mag.* tab. 8603).—Canary Islands. Family *Leguminosae.* Tribe *Loteae.* Herb. Leaves 3-foliate, umbels 3–5-flowered, 1½ in. across.—*G. H.*

Mangos in Florida. By P. H. Rolfs (*U.S.A. Exp. Stn., Florida, Bull.* 127, pp. 105–138 ; 17 figs.). A description of the varieties of Mango and their cultivation in Florida.—*S. E. W.*

Maurandia Purpusii. By R. de Noter (*Le Jard.* vol. xxviii. p. 232 ; 1 col. plate).—*Maurandia Purpusii* can be raised from seed in a light soil, in a temperate house. Avoid excess in watering. When the seedlings have 5 or 6 leaves,

prick out into small pots and cover with a bell glass. It can also be propagated from cuttings, or treated like a Dahlia and grown from the tubers which are dried before winter. The stalk attains a height of two feet, and is weighed down by the abundance of purple flowers with which it is covered.—*S. E. W.*

Mechanical Analyses conducted at Varying Temperatures, Note on the Effect of Changes in the Viscosity of Water on. By G. W. Robinson (*Jour. Agr. Sci.* vii. Part 2, pp. 142–3; Sept. 1915).—A mixture of fine sand and silt was submitted to mechanical analysis, by sedimentation, at temperatures of 6°C., 11°C., and 16°C. The amounts of fine sand found at these temperatures were in the proportions 100, 105·7, and 108·1 respectively. These discrepancies are due to the decrease in the viscosity of water as the temperature rises, resulting in a smaller deposition of larger particles at the lower temperature. It is therefore recommended that sedimentation should be carried out as far as possible at a uniform temperature, say 12°C. to 14°C. —*J. E. W. E. H.*

Meconopsis Prattii (*Bot. Mag.* tab. 8619).—Western China. Family *Papaveraceae.* Herb, 1–3 ft. high. Leaves rosulate, 3–5½ in. long, hirsute. Flowers in racemose cymes, 2 in. across. Petals 6–8, bright blue, flushed with purple. Anthers pale yellow.—*G. H.*

Melons, Fungus Attacks. By E. Molinas (*Le Jard.* vol. xxviii. pp. 215, 216, 2 figs.).—Attacks of *Plasmopara cubensis*, which makes yellow blotches on the upper surface of the Melon leaves, can be prevented by spraying with 1 per cent. solution of copper sulphate. Dusting with flowers of sulphur, mixed with ¼ of its weight of powdered quicklime, checks the ravages of *Sphaerotheca Humuli* and *Erysiphe Polygoni.* No cure is known for *Colletotrichum oligochaetum* and *Scolecotrichum melaphthorum.* These fungi cause brown marks on the leaves, stems, and fruit, giving the last a nauseous bitter taste. Collect and burn the diseased parts.

Spraying with copper solutions checks leaf scorch, due to *Alternaria Brassicae* and *A. Cucurbitae.* If the Melon shows signs of rotting at the neck, plaster the affected part with Bordeaux mixture. Repeat the treatment from time to time. Green fly and red spider are destroyed by spraying with a mixture of soap and nicotine. Attacks of caterpillars and grubs are prevented by watering between the plants with a 2 per cent. solution of potassium sulpho-carbonate.
S. E. W.

Mesembryanthemum stylosum (*Bot. Mag.* tab. 8595 B).—South Africa. Family *Ficoideae.* Tribe *Mesembryeae.* Herb, small, succulent. Leaves fused below with 2-lobed apices 1–2 in. long. Corolla ⅞–1⅛ in. across, yellow.—*G. H.*

Mesembryanthemum thecatum (*Bot. Mag.* tab. 8595 A).—South Africa. Family *Ficoideae.* Tribe *Mesembryeae.* Herb, small, stemless, succulent, tufted. Leaves consolidated in obconic bodies ⅛ in. thick, bluish-green. Corolla ½–⅝ in. across, rose-purple with yellow eye.—*G. H.*

Metrosideros diffusa (*Bot. Mag.* tab. 8628).—New Zealand. Family *Myrtaceae.* Tribe *Leptospermeae.* Shrub, far-climbing. Leaves short-petioled; blade oblong, ¼–¾ in. long. Flowers cymose; corolla, petals, orbicular, ½ in. across, pink.
G. H.

Mistletoe. By M. A. Meunissier (*Jour. Soc. Nat. Hort. Fr.* June 1914, p. 432).—The French Minister of Agriculture has caused an inquiry to be made into the subject of the propagation and harmfulness of mistletoe. The results appear to show that certain trees are quite immune from this parasite, and that it is probably not seriously harmful except perhaps on certain trees, or unless it is present in great quantity. Poplars, pears, and almonds are said to be those which do suffer from its presence, and the apple and the poplar are of all trees its favourite lodging-place. It is considered probable that there are several sorts of mistletoe, and that the variety peculiar to one kind of tree will not grow on any other. It prefers chalk or clay and chalk soil, and has been noticed in the Alps at a height of 1,100 mètres. Certain birds and even the squirrel are said to disseminate the seed.—*M. L. H.*

Momordes tigrinum (*Bot. Mag.* tab. 8597).—Upper Amazon. Family *Orchidaceae.* Tribe *Vandeae.* Herb, epiphytic; pseudo-bulbs 4–7 in. long. Leaves 1–1½ ft. long. Scapes 4–6 in. long. Flowers, sepals spreading, lanceolate, yellow, with purple blotches; petals purple, with numerous darker purple blotches; lip small, incurved.—*G. H.*

Mutation in Oenothera, Additional Evidence of. By H. H. Bartlett, with 17 figs. (*Bot. Gaz.* vol. lix. p. 81).—This long and elaborate paper brings out certain facts which appear to be incompatible with earlier experiments leading

to the view that mutants are the result of crossing (heterozygosis). The author raised mutants for a self-fertilizing species of *Oenothera*.

It may be observed that many wild plants have varieties, although continually self-fertilized, as the knotgrass (*Polygonum aviculare*) described by Hooker in his "Student's Flora." Again, all the plants of the desert near Cairo have varied to become cleistogamous, since there are no insects there.

The author gives eight conclusions. The important are: (1) *Oe. pratincola*, a self-pollinating species, is in a mutating condition comparable with that of *Oe. Lamarckiana*. (5) The mutation ratio cannot be explained on Mendelian grounds. (8) The phenomena of *Oe. Lam.*, *Oe. biennis*, and *Oe. pratincola* cannot be attributed to heterozygosis.—*G. H.*

Nasturtium Wilt caused by Bacterium Solanacearum. By M. K. Bryan (*Jour. Agr. Res.* iv. pp. 451–458, August 1915; plates).—A disease of *Tropaeolum majus* characterized by the leaves being mostly wilted, yellowed, or dead, and the stem having a peculiar translucent or water-soaked appearance, allowing the vascular bundles to show as darkened streaks beneath the unbroken epidermis. When cut across, a greyish white viscid slime exudes from the bundles, and becomes brown on standing. Inoculation and cultural experiments established the identity of the causal organism as *Bacterium Solanacearum*. The bacteria may enter through wounded roots or shoots, or through the stomata. Potato, egg plant, Ageratum, Verbena, tobacco, tomato, pea-nuts, and pepper are all liable to be attacked.—*F. J. C.*

Naturalization, Experiments in (*Rev. Hort. d'Alg.*, No. 1, Jan. 1914, p. 6).—Notes on the behaviour of some exotic trees and plants of economic importance which are being planted in experimental gardens in Algeria.

These include the coffee plant, camphor tree, Casuarina, Vanilla, rice, Sarsaparilla, yam, &c.—*M. L. H.*

Nitrogen-fixing Power, Effect of Moisture Content of a Sandy Soil on its. By C. P. Lipman and L. T. Sharp (*Bot. Gaz.* vol. lix. p. 402).—From the tables of experiments the conclusion is drawn that when both aerobic and anaerobic bacteria are present the greatest fixation of nitrogen will occur at a moisture content very favourable for the most active forms of nitrogen-fixing bacteria. In the soil used it would appear that the aerobic forms do best with a 20 per cent. moisture content. At higher percentages of moisture up to 24 per cent. the anaerobic forms become much more active, while the aerobic forms are depressed in their nitrogen-fixing powers.—*G. H.*

Nitrogenous Fertilizers, Determination of their Availability. By C. B. Lipman and P. S. Burgess (*U.S.A. St. Bd., Berkeley, California, Bull.* 260; 19 pp.).—A discussion of the best form in which nitrogen may be added to the arid soils of California, and the conclusion is reached that for such soils low-grade fertilizers such as cotton-seed meal, bone manure, sewage sludge, &c., are most economically transformed by the soil flora.—*E. A. Bd.*

Norway Pine in the Lake States. By Theodore S. Woolsey, Jr., and Herman H. Chapman (*U.S.A. Dep. Agr., Bull.* 139, December 4, 1914).—Norway pine, or red pine (*Pinus resinosa*) as it is sometimes called, is a tree whose importance is certain to increase. Even now it is important commercially. From the standpoint of forest management, however, its special value lies in the fact that it makes better growth on poor soils than does its associate, white pine; it prunes itself of branches earlier, is more hardy, is freer from injury by insects or fungi, and ranges over as wide a territory.

The better quality Norway pine wood is soft, light, moderately strong and tough, fine, and straight-grained. It is easy to work, but is not durable in contact with the soil. The best grades are cut from trees of rapid growth, on low, moist, rich soil, and exhibit very little contrast between early and late growth. Lumber cut from slow-growing trees, on dry, sandy soils, is redder in colour, more resinous, and somewhat harder and more durable than the other. There is also a marked difference between the weight and quality of lumber cut from young stands and from mature timber, due to the percentage of sapwood in the former.

Norway pine is adapted for most of the uses to which white pine is put. It was first cut in Maine and Canada for shipbuilding material, such as decking, planking, spars, and masts. It is used locally for bridges, though it is distinctly inferior to long-leaf pine and Douglas fir for the purpose. Perhaps it is in widest demand for dimension stuff and for ordinary house construction. The lower grades and smaller sizes are consumed largely by the box trade for crates and

shipping boxes, and less frequently for shingles and water-pipes. The better grades are used for farm implements, planing-mill products, furniture, car construction, panels, screens, doors and sashes, and, when treated with preservatives, for poles, posts, and ties.—*A. D. W.*

Onion Culture. By J. W. Lloyd (*U.S.A. Exp. Stn., Illinois, Bull.* 175, pp. 337–362).—Plant early. Onions grown from sets ripen earlier than those from seed, are less affected by unfavourable weather, and yield a more remunerative crop.—*S. E. W.*

Orchard Bark Beetles and Pin-hole Borers. By H. A. Gossard (*U.S.A. Exp. Stn., Ohio, Bull.* 264, October 1913).—Few, if any, insects can more quickly kill a tree than those small beetles known as bark beetles, or quite generally as shot-hole borers. The adult beetles make the small openings, resembling shot-holes, through the outer bark, either to obtain food or to construct brood chambers in which their young can develop. The larvæ of the most destructive species make numerous radiating, sinuous galleries through the growing or sap wood, thus attacking the tree in a vital part. Thus it may happen that a tree will suddenly wilt and die in midsummer before the owner has noticed that it is in any way diseased; however, such an attack generally indicates a low state of vitality, and weakened trees are certain to be the ones first chosen for destruction. Healthy trees are sometimes attacked, but are rarely or never killed within a brief space of time. The most common species is the Fruit Bark Beetle (*Eccoptogaster rugulosus*), often called the Shot-hole Borer. It attacks nearly all species and varieties of orchard fruits. After this species the Peach Bark Borer (*Phloeotribus liminaris*) ranks next in importance in Ohio, and, at its worst, this beetle can do as much damage as the first. A few other nearly related species have somewhat similar habits, being known as Pin-hole Borers, but these are of minor importance, and are, therefore, given but brief notice in this publication. These Pin-hole Borers make their burrows in the heartwood, but the external openings through the bark resemble the exit holes of the Shot-hole Beetles, except that they are smaller.

Probably the most important measure to prevent multiplication of all these beetles is to burn promptly all prunings, dead wood, and dying trees.

Attacked orchards can be successfully reclaimed from attack by cultivation, by liberal fertilization with barnyard manure and commercial fertilizer, and by whitewashing or spraying with carbolized soapy mixtures. Treatment should commence in the spring.—*A. D. W.*

Ornithoboea Lacei (*Bot. Mag.* tab. 8627).—Burma. Family *Gesneriaceae*. Tribe *Cyrtandreae*. Herb. Stem 4 in. long. Leaves, petiole 5 in. long, blade 3 in. long, 2½ in. broad, ovate. Cymes axillary. Corolla ¾ in. from front to back, rose. *G. H.*

Oxalis, Self-Fertilization of. By E. Gadeceau (*Le Jard.* vol. xxviii. pp. 197, 198; 1 fig.).—Many species of Oxalis will not produce seed unless a mixture of heterostylic forms are planted together. *Oxalis corniculata, O. stricta,* and *O. Acetosella* are homomorphous and seed abundantly. In the Jardin des Plantes at Nantes *O. valdiviana,* from Chile, produces plenty of seed, the long-styled and the short-styled forms growing together. *O. carnosa* is tender. It is a native of Chile and is self-fertilizing, producing seed in abundance. *O. rosea,* from Chile, seeds freely at Nantes, although only the long-styled form has been seen. Further research on this point is desirable.

O. Marsiana bears lilac-pink flowers but no seed, although the short- and mid-styled forms are grown. *O. tetraphylla* has purple-violet flowers, but does not seed. Only the long-styled form is grown.—*S. E. W.*

Oxidases in Plants, Evidence of the General Distribution of. By G. B. Reed (*Bot. Gaz.* vol. lix. p. 407). — Experimenting with Algae, "they gave uniform results; hence it is inferred that oxidases are of general occurrence among the Algae. These, and the writer's observations on acid tissues, indicate that the oxidases are universally distributed in living plants; and that cases of their apparent absence may be explained in ways similar to those discussed in the present paper."—*G. H.*

Panicum globoideum Domin. By J. H. Maiden and E. Cheel (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 131, 132; 1 plate).—The Australian grass *Panicum globoideum* has been confused with *P. flavidum.* It has a different panicle, with two dense rows of sessile spikelets, usually very oblique and smaller, with thinner and less nerved glumes. It is a valuable grass for grazing animals.—*S. E. W.*

Passiflora coerulea. By C. Arranger (*Le Jard.* vol. xxix. pp. 312–314; 2 figs.).—Many beautiful hybrids have been obtained by crossing *Passiflora coerulea* with *P. incarnata*, white flowers marked with blue on the petals; with *P. kermesina*, purplish-white flowers, nearly hardy; with *P. racemosa*, purple flowers, hardy. *P. Pfordtii*, a cross between *P. coerulea* and *P. alata*, has a flower with a pink cup, white petals, and a blue, white, and blackish crown. The well-known *P.* × *Impératrice Eugénie* is probably a hybrid of *P. coerulea* and *P. alata* or *P. quadrangularis*.—*S. E. W.*

Pear Pest, The False Tarnished Plant-bug as a. By P. J. Parrott and H. E. Hodgkiss (*U.S.A. Dep. Agr., New York Agr. Exp. Stn., Bull.* 368. November 1913; 8 plates, 2 figs.).—During some seasons pears in New York are affected by a diseased condition, characterized by the cracking open of the skin in small spots and the formation of protruding granular areas.

Recent investigations have shown that the injuries are largely caused by a true sucking plant-bug (*Lygus invitis* Say). The damage is done by the nymphs, which attack both fruit and foliage. Grape blossom clusters are also liable to attack. The adult is similar in appearance to the well-known tarnished plant-bug.

Spraying as blossoms drop with tobacco extract (40 per cent. nicotine) to 100 gals. water, and to which are added 3 lb. of dissolved soap, largely prevents injury, but the spray must be thoroughly well applied.—*V. G. J.*

Phelipaea foliata (*Bot. Mag.* tab. 8615).—Crimea and Caucasus. Family *Orobanchaceae*. Herb, at Kew parasitic on *Centaurea dealbata*. Herb, leafless, parasitic; stems simple, 1–1½ ft. high. Scales ovate, oblong. Flower terminal, solitary; the three lower petals, together, 2 in. across, the two upper 1½ in. across, brilliant crimson, with 2 black basal spots.—*G. H.*

Phosphates, The Importance, Selection, and Use of, in Agriculture in Massachusetts. By Wm. P. Brooks (*U.S.A. Exp. Stn. Mass., Bull.* 162, May 1915, pp. 127-167; 2 plates).—This bulletin shows that phosphoric acid is not relatively deficient in soils in Massachusetts, and that under the systems of agriculture commonly practised there is no reason to believe that it is becoming more so.

The general results of two series of experiments with different phosphates (one series extending over 18 years, the other over 12 years) are given. These seem to show that the application of at least a moderate amount of phosphate is usually profitable, and that the more soluble and available materials give better results than those obtained from finely-ground rock phosphates. The soluble phosphates favour more rapid early growth, earlier maturity, and larger yields than the rock phosphates, and thus the former may be used with greater profit than the latter.—*A. B.*

Pinguicula gypsicola (*Bot. Mag.* tab. 8602).—Mexico. Family *Lentibulariaceae*. Herb, in flower 3½ in. high. Leaves, many heteromorphous; summer leaves linear, 2½ in. long. Winter leaves, rosette, ¾ in. across, like that of a houseleek; leaf, spathulate, ½ in. long. Flowers, corolla purple, lobes linear oblong, spur purplish, 1 in. long, slender.—*G. H.*

Plant Diseases in England and Wales, 1914-15 (*Jour. Bd. Agr.* xxii. No. 10, Jan. 1916).—Owing to the necessity for economy, the Annual Report of the Horticultural Branch of the Board of Agriculture will not be published, but a statement of the present position of affairs as regards the most important diseases of plants has been prepared. Under American Gooseberry Mildew it is stated that the disease appeared at an earlier date in 1914 than had previously been recorded, and that there was an unusually severe attack on the fruit. This was probably due to the mild spring, but owing to dry weather later the intensity of the attack did not increase, although the extent did. Notwithstanding the disorganization of labour due to the war, the gardens as a whole were satisfactorily treated earlier than usual, with the result that there was a general opinion that the condition of the fruit on the whole was far better in 1915 than in the previous year. Experiments that were conducted have confirmed the policy of the Board, and show that, while spraying and tipping are the best remedy against American Gooseberry Mildew, tipping alone is distinctly valuable, while spraying alone cannot be depended upon.

The present condition of wart disease is commented on, as is its distribution. A number of cases of affected field crops have been found, and Special Orders have been made declaring whole groups of allotments "infected." The procedure of the Board is to allow potatos to be planted only by licence, and only varieties known to be immune to the disease are allowed. A large number of

licences was issued in 1914 and 1915, and in only one or two doubtful cases did the disease reappear. Corky Scab of Potatos, Silver Leaf, *Dilophia graminis*, and Apple Mildew are also dealt with.

Amongst insect pests the Japanese Fruit Scale (*Diaspis pentagona*) is the most important to which reference is made. It was discovered in two nurseries, having been imported on ornamental cherry trees.—*G. C. G.*

Plants, Enemies of. By M. E. Lemée (*Jour. Soc. Nat. Hort. Fr.* April 1914, p. 229; figs.).—An article on witches' brooms, which are described and illustrated, and the cause of each is given. In each case the removal and destruction of the malformed part is advised, and other remedies are suggested.—*M. L. H.*

Plums derived from Native American Species of Prunus. By W. F. Wight (*U.S.A. Dep. Agr., Bull.* 172; 44 pp.).—An interesting compilation of American-raised Plums, showing how far they are derived from native species. *Prunus americana* has most to its credit, but none of these are known in this country for the reason that they are vastly inferior to the *domestica* varieties upon which we mainly rely. The parentage given cannot in all cases be accepted as unimpeachable.—*E. A. Bd.*

Polystachya paniculata (*Bot. Mag.* tab. 8618).—Tropical West Africa. Family *Orchidaceae*. Tribe *Vandeae*. Herb, epiphytic. Stem 3–6 in. long, 3–4-foliate. Leaves 5–7 in. long. Flowers numerous, small; lip recurved, orange; other petals and sepals yellow, streaked with orange.—*G. H.*

Populus lasiocarpa (*Bot. Mag.* tab. 8625).—China. Family *Salicaceae*. Tree 40–60 ft. high. Leaves ovate, deeply cordate, blade 4–5 in. long. Catkins 4–6. Capsules densely woolly.—*G. H.*

Potato Disease, A New. By Pierre Passy (*Jour. Soc. Nat. Hort. Fr.* July–Dec. 1914, p. 500).—A disease of the potato which affects the young sprouts, and which has only recently been observed, is here described. The sprouts when they appear are long, thin, and bent, and when planted soon perish and produce no crop. The cause of the disease is still uncertain, and no cure for it is known. For early planting all affected tubers should be rejected, but even this precaution in main-crop planting on a large scale when the tubers have not been first started will be practically impossible to carry out.—*M. L. H.*

Potato Diseases in Michigan. By G. H. Coons (*U.S.A. Agr. Exp. Stn., Michigan, Special Bull.* 66, March 1914, pp. 1-32; 13 figs.).—The commoner diseases of the potato (Late Blight, Early Blight, Scab, Rhizoctonia, Dry Rot, Wet Rot, and Deep Scab) are generally met with in Michigan. The bulletin gives a popular account of these diseases and suggests various control measures, as follows:—To control Late Blight and Early Blight, Bordeaux mixture (4-4-50) should be sprayed when tops are a few inches above the ground, and repeated every fourteen days during the growing season.

To control Potato Scab, soaking the tubers in weak formalin solution for two hours is useful. To control Rhizoctonia, Deep Scab, and Fusarium Wilt, it is suggested that only clean smooth tubers should be used, though disinfection in formalin solution is useful.—*A. B.*

Potato Diseases, Investigations on. By G. H. Pethybridge (*Jour. Dep. Agr. and Tech. Inst., Ireland*, xv., April 1915).—A test of powder spraying (copper sulphate and carbonate of soda) against Burgundy mixture resulted greatly in favour of the latter both in total yield and in percentage of disease-free tubers (*Phytophthora infestans*). Similar trials with other powders containing copper and with Bordeaux paste against Bordeaux mixture showed the superiority of the home-made mixture over the others in preventing ordinary potato disease. Burgundy mixture made with potassium carbonate instead of with washing soda gave very slightly greater yields than the ordinary Burgundy mixture, and this at considerably greater cost.

Comparisons between the resistance of different varieties to potato disease were made, with result that 'Champion II.' and 'Clifden Seedling' remained green throughout the growing season, while the other varieties succumbed to a greater or less extent, 'Duchess of Cornwall' giving 100 per cent. diseased tubers. 'Shamrock,' 'Northern Invincible,' 'Summit,' 'Arran Chief,' 'Arran's Hope,' 'What's Wanted,' 'Langworthy,' 'Golden Wonder,' 'Peacemaker,' 'King Edward VII.' were the other varieties tried. Where diseased tubers were planted either the set "missed" altogether or gave rise to a healthy plant.

Experiments with the sclerotium disease (*Sclerotinia sclerotiorum*) showed that certain varieties, particularly 'Clifden Seedling' and 'Summit,' were more resistant than others.

Experiments with the "pink rot" organism (*Phytophthora erythroseptica*) confirmed its rôle as a wilt-producing fungus, and tests of varieties of potato from Holland and the United States showed that none of these were really resistant to the attack of *Spongospora subterranea.*

Successful attempts were made to repeat Rolf's work with *Rhizoctonia Solani*, which is common in England, forming blackish sclerotia on the surface of potato tubers. He considered this fungus a stage in the history of *Hypochnus Solani* (giving it the name of *Corticium vagum* var. *Solani*), and now other workers have confirmed this.

Notes are also given on the diseases of the tubers induced by *Spondylocladium atrovirens* and *Spicaria Solani* (the conidial form of *Nectria Solani*) and upon the ordinary potato scab, which is shown to be preventible by soil sterilization, and which American investigation has proved to be identical with the American scab induced by *Actinomyces chromogenus.*—*F. J. C.*

Potato, Late Blight of. By G. P. Darnell-Smith and E. Mackinnon (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 673–678; 3 figs.).—Irish Blight or Late Blight of the potato is caused by the fungus *Phytophthora infestans.* To control this disease avoid the use of seed from a crop that is known to have been diseased. All haulms and small potatos from a diseased crop must be collected and burned. Spray early and often with Bordeaux or Burgundy mixture. Some varieties are less subject to attack than others, so that it is possible that a disease-resisting strain may be produced.—*S. E. W.*

Potato-Scab Organism, Effect of Temperature on Germination and Growth of. By M. Shapovalov (*Jour. Agr. Res.* iv. pp. 129–134, May 1915; figs.).—The organism hitherto generally known as *Oospora scabies* has recently been identified with *Actinomyces chromogenus.* The author has tested the temperature relations of this organism and finds it germinates best between 35° and 40° C., but these temperatures are unfavourable for long-continued growth. The optimum temperature for growth is about 25° to 30°, the maximum being 40·5° and the minimum 5° C. Differences in temperature apparently also affect the metabolism of the organism, for culture media were deeply stained when organisms were growing below 30° C., and but faintly or not at all at above 35° C.—*F. J. C.*

Potato Storing. By L. Malpeaux (*Jour. Soc. Nat. Hort. Fr.* Nov. 1913, p. 747).—The writer examines the usual methods of storing potatos and advises the complete removal of the eyes with a knife before storing, or, if a large crop has to be treated, the tubers may be soaked in a 1 to 2 per cent. solution of sulphuric acid in water. They may be dried and stored afterwards, and it will not be necessary to wash them before feeding them to stock. It has been proved that potatos will keep well in a silo of maize or some green crop, the temperature of which must not exceed 72 degrees. M. Vilmorin has adopted a method of storage which the writer describes. The tubers are put into cheap wicker baskets holding about a hectolitre each, and the baskets are piled in double rows. The piles take up practically no more room than an ordinary heap, cost very little more, ventilation is assured, and if the storage place is dry the result will be found most satisfactory.—*M. L. H.*

Prairie Grove, Invasion of a (*Bot. Gaz.* lx. p. 331).—A grove was started about forty years ago by planting seeds of species of Ash, Walnut, Elm, and Maple. No cultivation was attempted. With regard to the undergrowth, it is found that not only is the prairie sod now gone, but nearly every one of the original prairie species has entirely disappeared, being replaced by some ninety invading species, of which 85 per cent. are mesophytic and 60 per cent. are distinctly woodland; so that the area has been transformed from prairie to forest in forty years.—*G. H.*

Prickly Pears (continued). By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 489–493; 1 plate, 1 col. plate).—The Scone Prickly Pear grows 10 feet high and has very large joints (1 foot), with abundant white recurved spines in clusters. The flowers are orange-yellow, and the barrel-shaped fruit has a rich orange colour. It is perhaps identical with *Opuntia Amyclaea.*—*S. E. W.*

Primula acaulis, Inheritance of Heterostylism in. By R. P. Gregory (*Jour. Gen.* iv. pp. 303–4; Apr. 1915).—Experiments show that the inheritance of long styles is dominant over that of short styles in the primrose, as in *Primula sinensis.* *F. J. C.*

Primula Myabeana (*Bot. Mag.* tab. 8603).—Formosa. Family *Primulaceae.* Tribe *Primuleae.* Herb. Leaves 8 in. long. Scape single, 2 ft. long, with 6–10-flowered superposed whorls. Corolla purple, 1 in. across.—*G. H.*

Primula, New Species. By Prof. I. B. Balfour (*Notes Roy. Bot. Garden, Edinburgh*, ix. pp. 1-62).—Fifty new species of *Primula*, mostly from China, are described, with critical notes on various forms already named but not fully described, or described upon scanty material. The following are the names of the new species, those already in cultivation being marked *:—* *Primula aemula* (Maximowiczii—Yunnan), *P. alsophila* (Geranioides—Tibet), *P. alta* (Denticulata—Yunnan), *P. annulata* (Yunnanensis—N.-W. Yunnan), *P. Calderiana* (Sonchifolia—Sikkim), *P. celsiaeformis* (Malvacea—W. China), *P. Tenana* (Malvacea—Yunnan = *P. blattariformis* var. *Duclouxii*), [*P. racemosa* Bonati is sunk as being only a poor plant of *P. bathangensis*], *P. cephalantha* (Muscarioides—Yunnan), *P. chionantha* (Nivalis—Yunnan), **P. citrina* (Auriculata—W. Kansu), *P. compsantha* (Pulchella—Yunnan), **P. conspersa* (Auriculata?—W. Kansu), *P. coryphaea* (Bella—Burma), *P. fasciculata* (Auriculata?—Yunnan), *P. florida* (Souliei—Yunnan), *P. fragilis* (Yunnanensis—Upper Burma), *P. Gageana* (Amethystina—Sikkim), *P. glandulifera* (Minutissima—Kumaon), *P. Harrissii* (Rosea—Afghanistan), *P. helvenacea* (Calliantha—N.-W. Yunnan), *P. indobella* (Bella—Bhutan), *P. leimonophila* (Amethystina—Hunan), *P. lhasaensis* (Souliei—Tibet), *P. meiantha* (Malacoides—Burma, Shan States), *P. melichlora* (Minutissima—Sikkim), **P. minor* (Pulchella—Yunnan), *P. nemoralis* (Sonchifolia—Yunnan), *P. oresbia* (Incisa—Hunan), *P. petrophyes* (Amethystina—Hunan), *P. philoresia* (Dryadifolia—N.-W. Yunnan), *P. prionotes* (Sikkimensis—Tibet), * *P. pseudomalacoides* (Malacoides—Yunnan), * *P. pulchelloides* (Pulchella—N.-W. Yunnan), *P. rhodantha* (Rosea—Afghanistan), *P. riparia* (Mollis—Kansu), *P. rosiflora* (Rosea—Chitral), *P. rupicola* (Souliei—Yunnan), *P. sciophila* (Bella—Upper Burma), *P. seclusa* (P. Mollis—Yunnan) **P. sinomollis* (Mollis—Yunnan) and var. *alba* (Yunnan), * *P. sphaerocephala* (= *P. capitata* Forrest—Sphaerocephala—Yunnan), *P. stolonifera* (Denticulata—Yunnan), *P. tanupoda* (Auriculata—W. Himalaya), *P. taraxacoides* (Sonchifolia—Yunnan), *P. Traillii* (Sikkimensis—N.-W. Himalaya), *P. Umbrella* (Yunnanensis—Yunnan), *P. Viola-grandis* (Omphalogramma—Kansu), *P. Waddellii* (Minutissima—Tibet), *P. Waltoni* (Sikkimensis—Tibet), * *P. Wardii* (Auriculata—Yunnan), *P. Woodwardii* (Nivalis—N.-W. China).—*F. J. C.*

Primula pycnoloba (*Bot. Mag.* tab. 8612).—Szechuan. Family *Primulaceae*. Tribe *Primuleae*. Herb with root-buds. Leaves cordate, 6 in. across. Scape to 8 in. high, with a dense-flowered raceme. Flowers bracteate, bracts lanceolate, 1½ in. long. Calyx sub-foliaceous, 1½ in. long. Corolla ½ in. across, dark pink. *G. H.*

Primula sinensis, Variegation in. By R. P. Gregory (*Jour. Gen.* iv. pp. 305, 322, Apr. 1915; plates).—A race of *Primula sinensis*, having light green or yellow foliage, and producing also variegated forms, was investigated. The green, variegated, and pale yellowish-green characters are transmitted entirely by the egg-cells, the pollen exerting no influence on these characters. The author brings forward an hypothesis to account for the phenomena.—*F. J. C.*

Promenaea microptera (*Bot. Mag.* tab. 8631).—Tropical South America. Family *Orchidaceae*. Tribe *Vandeae*. Herb. Epiphytic. Pseudo-bulbs clustered, ¾ in. long, 2-foliate. Leaves 3–3½ in. long. Flowers pale green, 2 in. across. Lip 3-lobed, ¾ in. long, with two transverse red bars and three spots at the tip.—*G. H.*

Pteronia incana. By P. Hariot (*Le Jard.* vol. xxix. p. 305).—*Pteronia incana* is a branching shrub about three feet in height, with numerous heads of yellow flowers. It is widely distributed in Africa from Namaqualand to Albany. *S. E. W.*

Pyrethrum cinerariaefolium, The Cultivation of, in France (*Rev. Hort. d'Alg.* No. 10, Oct. 1913, p. 382).—This plant, which has hitherto been largely cultivated in Dalmatia and Montenegro for the production of pyrethrum powder to be used in insecticides, has been proved to grow and flourish in Southern France and in the French African colonies. Hitherto the low price at which the powder is procurable has made the cultivation of it not sufficiently profitable in France, but the Balkan wars so much restricted the output in the original home of the industry that a price may now be obtained for it which it is contended would make the crop quite remunerative in France and Algeria. This article describes the method of cultivation, and gives a chemical analysis of the powder and an account of the system of collection and distribution in the various original centres of the trade.—*M. L. H.*

Pyrus yunnanensis (*Bot. Mag.* tab. 8629).—China. Family *Rosaceae*. Tribe *Pomeae*. Tree, 20–30 ft. high. Leaves deciduous, ovate, serrate, 2–4½ in. long. Flowers ⅝ in. wide, in racemose corymbs, 2½ in. across. Petals pale pink. Fruit globose, ½ in. diam.; deep red, specked with white dots.—*G. H.*

Rhododendron concinnum (*Bot. Mag.* tab. 8620).—Western China. Family *Ericaceae*. Tribe *Rhodoreae*. Shrub. Leaves 1½–3 in. long. Flowers sub-umbellate, 2 in. across, carmine.—*G. H.*

Rhododendron Davidsonianum (*Bot. Mag.* tab. 8605).—China. Family *Ericaceae*. Tribe *Rhodoreae*. Shrub, 3½–10 ft. high. Leaves 1–2½ in. long. Corolla pale rose, 1½ in. across; lobes oblong; stamens exserted, spreading.—*G. H.*

Rhododendron moupinense (*Bot. Mag.* tab. 8598).—Western China. Family *Ericaceae*. Tribe *Rhodoreae*. Shrub, 2½ ft. high. Often epiphytic, wild. Leaves 1¾ in. long. Flowers 1–3-nate. Corolla white, 2½ in. across, red-dotted on posterior side. Stamens, exserted with purple anthers.—*G. H.*

Rhododendron Souliei (*Bot. Mag.* tab. 8622).—Western China. Family *Ericaceae*. Tribe *Rhodoreae*. Shrub. Leaves oblong, rounded at apex, 1½–3 in. long, pale green below. Flowers in clusters, about 8-flowered. Corolla rosy red in bud, white with a rosy flush open, 2½ in. across, 5–6-lobed.—*G. H.*

Rhododendron stamineum (*Bot. Mag.* tab. 8601).—Western China. Family *Ericaceae*. Tribe *Rhodoreae*. Shrub. Leaves 2–4 in. long. Inflorescence short 10-nate, flowers fragrant. Corolla white, posterior petals yellow at the base, 2½ in. across.—*G. H.*

Rhododendrons and Lime. By A. Grove (*Gard. Chron.* Jan. 29, 1916, p. 65). A record of an interesting experiment. A set of seedlings of Asiatic species were planted in August 1914 in naturally calcareous soil and further supplies of lime added. Some have already died and others are sickly, but many, especially small-leaved species, are still flourishing. Sixteen species are mentioned as doing well.—*E. A. B.*

Root-knot Disease. By L. Childs (*U.S.A. St. Com. Hort., Cal., Bull.* vol. ii. No. 12, December 1913; 18 figs.).—Root-knot is usually caused by a minute semi-transparent worm, *Heterodera radicicola*, which establishes itself in the issue of the root system, producing an abnormal development of the root. At present no entirely satisfactory method of control for orchard or field work has been discovered. In greenhouse and seed-bed steam is most satisfactory. Formaldehyde is a good chemical to apply. Successful treatment has been obtained in using the following formula:

Commercial (36 to 40 per cent.) formaldehyde	1 part.
Water	100 parts.
Application per square yard	1 to 1½ gallons.

V. G. J.

Rose Aphis, The. By H. M. Russell (*U.S.A. Dept. Agr., Bur. Entom., Bull.* 90, May 1914; 3 plates, 1 fig.).—The following formula is recommended as highly satisfactory. The terminal buds and tender shoots were slightly injured; 100 per cent. of the aphides were killed.

Nicotine sulphate	½ oz.
Whale oil soap	½ lb.
Water	5 gallons.

V. G. J.

Roses under Clock Glasses. By L. Daniel (*Le Jard.* vol. xxix. pp. 289, 290; 1 fig.).—Protection can be given to delicate blooms on dwarf roses by means of a clock glass supported on three oak stakes. The top and the side of the glass which faces south are covered with muslin to protect the flowers from scorching.—*S. E. W.*

Sampling in Soil Surveys, The Probable Error of. By G. W. Robinson and W. E. Lloyd (*Jour. Agr. Sci.* vii. Part 2, pp. 144–153; Sept. 1915).—The authors point out that there is practically no literature on the subject. The soils of two fields were therefore investigated, 25 and 9 samples respectively being taken from them. In each sample the amounts of gravel, sand, silt, clay, moisture, organic matter, and phosphorus pentoxide were determined. The samples were then mixed and six mechanical and phosphoric oxide determinations of the two composite samples were made. From these results the probable errors

were calculated by the usual formula. The results show that if six borings are made of a soil under investigation and the borings mixed to form a composite sample there is a 4 to 1 probability that the accuracy of a duplicate mechanical analysis of the composite sample will be within 5 per cent. of the true value, and there is a similar probability that the chemical analysis will be within 8 per cent. of the true value. An increase in the number of borings does not markedly reduce the probable error.—*J. E. W. E. H.*

Sansevlera Laurentii. By M. J. Gérome (*Jour. Soc. Nat. Hort. Fr.* Jan. 1915, p. 14).—This is a variegated form of *S. guineensis* discovered in the Congo by Prof. Laurent. The variegation reappears in plants reproduced by division of the rhizome, but the writer finds that plants raised from leaf-cuttings revert to the type *S. guineensis.*—*M. L. H.*

Seeds, Growth of, in Heat compared with Growth in the Open. By M. M. Curé and Foëx (*Jour. Soc. Nat. Hort. Fr.* July–Dec. 1914, p. 500).—The observations of horticulturists that certain vegetables heart when sown in hot-beds, whereas they run to seed when sown in the open or in a cold frame, have caused some experiments to be made.

Tables are here given showing the relative growth of root and plant produced by turnip and chicory seed sown—(1) in the open, (2) in cold frames, (3) in a hot-bed. From these it appears that root growth takes place much more slowly at first in heat, which, on the other hand, produces leaves much earlier. The total length of the plant is at all times greater in heat, and at a later stage the roots also show a great increase in size over those produced without it.—*M. L. H.*

Senecio glastifolius (*Bot. Mag.* tab. 8624).—South Africa. Family *Compositae.* Tribe *Senecionideae.* Herb, perennial, erect, 4 ft. high. Leaves linear, 3 in. long, ½ in. wide. Heads 2 in. across. Ray florets rose-lilac. Disk yellow. *G. H.*

Simples. By P. de Vilmorin (*Jour. Soc. Nat. Hort. Fr.* Jan. 1913, p. 52).—A review of a dictionary of botanical synonyms collected with the most laborious care from the works of the sixteenth and later centuries. The scientific name of each plant is traced through all its changes in successive periods, the present form being sometimes but a slight variation on that given by the old herbalist, and sometimes having had to be entirely altered in consequence of more scientific classification.—*M. L. H.*

Soil Acidity, A New Test for. By E. Truog (*U.S.A. Agr. Exp. Stn., Wisconsin, Bull.* 249, Feb. 1915, pp. 1-16; 4 figs. and 1 plate).—It is stated that two-thirds of the soils of Wisconsin are acid, though the degree of acidity varies considerably. In some cases the soils are so acid that even clovers and lucerne cannot produce profitable crops. Thus the need of a simple test for determining the acidity of the soil is evident. Litmus paper, being affected by carbonic acid, is not entirely satisfactory, nor is hydrochloric acid, as it simply indicates the presence of carbonates. A new test has been devised which indicates not merely the presence of the acids but also the degree of acidity.

Use is made of the fact that, when acids are placed in contact with zinc sulphide, a gas (sulphuretted hydrogen) is evolved which acts upon lead acetate paper, forming the corresponding lead sulphide, and causes a blacking of the test paper. The amount of blackening will indicate the amount of acid. Applying this to the soil, if a solution of the soil be made with distilled water and some powdered zinc sulphide added, and the mixture warmed, sulphuretted hydrogen gas will be evolved. Its presence may be readily demonstrated by placing strips of lead acetate paper over the mouth of the vessel. The relative blackening of the paper will show the degree of acidity; the blackest, very strong acidity; while the slightest colouring will show very slight acidity.

A convenient form of apparatus is described, whereby field tests may be readily and quickly carried out.—*A. B.*

Soil Gases. By J. W. Leather (*Jour. Agr. Sci.* vii. Part 2, pp. 240–241; Sept. 1915).—The writer has subjected samples of Pusa soils to experiment as described by Russell and Appleyard [see abstract in *Jour. Roy. Hort. Soc.* xli. Part 1, pp. 166, 167, Aug. 1915] and concludes that the gas obtained by Russell and Appleyard was liberated gradually by bacteria. The authors of the original experiments point out in reply that the conditions of their experiments have been misunderstood by Leather, and particularly that as in some cases there was practically no interval between the experiments there was no time for the bacterial action presumed to have taken place. The results of the Pusa experiments, in fact, support their conclusions.—*J. E. W. E. H.*

Soil Formation, Effect of Climate on. By J. W. Leather (*Jour. Agr. Sci.* vii. Part 2, pp. 135–6; Sept. 1915).—The author instances two soils of India, viz. the Laterite and the Regur or Black Cotton Soil, the formation of neither of which can be attributed to weather or climate. The former consists largely of aluminium hydroxide; the latter contains up to 10 per cent. of calcium, and its black colour is due to a colloid, not attacked by concentrated hydrochloric acid, containing iron, aluminium, and silica, associated with a small proportion of organic matter. The author suggests that both soils may be a result of bacterial activity.—*J. E. W. E. H.*

Soil, The Comparative Effect on Different Plants of Liming an Acid. By B. L. Hartwell and S. C. Damon (*U.S.A. Agr. Exp. Stn., Rhode Island, Bull.* 160, Oct. 1914, pp. 405–446; 10 figs.).—This bulletin gives in tabulated form details of over 280 different varieites of plants, including 75 flowering perennials, 25 trees, 30 grasses and clovers, and 150 miscellaneous crops, grown upon four plots, equally and liberally treated as regards nitrogen, phosphorus, and potassium. Two of the plots received their nitrogen in form of sulphate of ammonia, and the other two in the form of nitrate of soda. To only one of each pair was slaked lime applied from time to time. The experiments have extended over twenty-two years.

The difference in the residual effect of sulphate of ammonia and nitrate of soda on the degree of soil acidity is shown to a marked degree, and as the same amounts of lime were added with the two sources of nitrogen, the resulting reaction was liable not to be optimum for the growth of a given plant.

The plants used included all grades, from those which are positively injured by an application of lime even to a very acid soil, to those which are unable to live on an acid soil and are benefited by lime.—*A. B.*

Soils, Absorption of Fertilizer Salts by Hawaiian. By Wm. McGeorge (*U.S.A. Agr. Exp. Stn., Hawaii, Bull.* 35, Aug. 1914, pp. 1–32).—The soils of Hawaii contain a very high percentage of iron and aluminium compounds, as well as large amounts of organic matter and humus. The experiments were undertaken to determine the absorptive power of these soils with regard to fertilizer salts, such as phosphoric acid (potassium phosphate), potash (potassium sulphate), and nitrogen (ammonium sulphate and sodium nitrate).

It was found that the fixation of phosphoric acid was higher than the other elements. This is largely due to the basic character of the soils. Crops were found to respond readily to soluble phosphates (sodium phosphate and acid phosphate). There was considerable difference in the physical action of calcium and potassium phosphates; the calcium salt filtered through the soil as a perfectly clear solution, while the potassium salt had a decided deflocculating action upon the clay.

Apparently the controlling factors in the fixation of potash are the amounts of lime and magnesia present. The fixing power of the potash is quite marked.

The fixation of the ammonium nitrogen is controlled by the same factors as for potash. It is, however, not so strongly fixed, and is leached out easily by rains and drainage water. The power of the soil for fixing nitrate nitrogen is small except in case of organic soils.—*A. B.*

Soils, The Effects of Strongly Calcareous, on the Growth and Ash Composition of certain Plants. By P. L. Gile and C. N. Ageton (*U.S.A. Agr. Exp. Stn., Porto Rico, Bull.* 16, Sept. 1914, pp. 1–45; 9 figs.).—This describes a series of experiments with rice, soy beans, bush beans, radishes, sunflowers, sweet cassava, sugar-cane, and pine-apples grown on various plots, one of which contained no carbonate of lime, the second approximately 5 per cent., the third 18 per cent., and the fourth 35 per cent., of carbonate of lime.

The following conclusions were arrived at:—

The growth of bush beans and radishes was unaffected by even 35 per cent. of $CaCO_3$; the growth of sunflowers, soy beans, and sugar-cane was somewhat checked by 18 per cent. of $CaCO_3$; the growth of sweet cassava was somewhat checked by 5 per cent. and markedly so by 35 per cent. of $CaCO_3$; while the growths of rice and pine-apples were markedly checked, with the appearance of chlorosis, by 5 per cent. or more of $CaCO_3$. The $CaCO_3$ apparently had no effect on the amount of nitrogen, phosphorus, and potash contained in the various plants. Those plants whose growths were little affected by the $CaCO_3$ (bush beans, soy beans, radishes, and sunflowers) showed marked decreases in the amount of iron or magnesia in the ash when grown on the calcareous soils.

The plants whose growths were most depressed on the calcareous soils (rice and pineapples) showed the greatest increases in the amount of lime in the ash and a marked decrease in the amount of the iron.—*A. B.*

Soluble Humus, the Effect of Removing from a Soil. By William Weir (*Jour. Agr. Sci.* vii. Part 2, pp. 246–253; Sept. 1915).—It has commonly been assumed that that portion of the humus of a soil which is soluble in dilute alkaline solutions plays, by reason of its solubility, an important part in plant nutrition. The author has, however, been able to find only one recorded experiment (Grandeau, 1872) designed to establish the truth or otherwise of the assumption. He has accordingly repeated Grandeau's experiment during two seasons on a larger scale. The soils were first washed with dilute hydrochloric acid to remove bases and then repeatedly extracted with dilute soda, whereby humus containing approximately 40 per cent. of the total nitrogen was removed. Four successive crops (wheat, mustard, rye, and mustard) were grown in the untreated and extracted soils respectively, and approximately equal total yields of dry matter and of nitrogen were obtained from the two series. Afterwards laboratory experiments were made to determine the rate of production of nitrate and of ammonia in untreated and in extracted soil, and it was found that removal of soluble humus increased the number of bacteria and the amount of ammonia but diminished the nitrate, the sum of ammonia and nitrate being usually less than in untreated soil. Russell and Hutchinson have shown that in uncropped soil the accumulation of nitrate and ammonia is stopped when a certain stage is reached, but in a cropped soil they are being constantly removed by the growing plant. Hence the conditions of the above-described vegetation and laboratory experiments are not the same, and therefore the results obtained from them are not inconsistent.—*J. E. W. E. H.*

Spruce, Two Rust Diseases of. By A. W. Borthwick and M. Wilson (*Notes Roy. Bot. Gard. Edinburgh*, xli. p. 65, Apr. 1915; plate).—The uredo and teleutospore stages of *Chrysomyxa Rhododendri* were discovered on *Rhododendron hirsutum* in Scotland; it also occurs on *R. ferrugineum* and *R. dauricum*. The alternate stage occurs on the spruce, and has been known as *Aecidium abietinum*. *Uredo Rhododendri* is the uredospore stage. *C. Abietis* occurs on the needles also, but goes through all its stages on the spruce; attacked leaves turn yellow and fall.—*F. J. C.*

Stocks (Matthiola), Doubles in. By E. R. Saunders (*Jour. Gen.* v. pp. 137–143; Dec. 1915).—The authoress reports the result of selecting the most vigorous and so on down to the least vigorous of the seedlings, and finds the percentage of doubles greater in the former than in the latter. She concludes that unconscious selection of this kind has led seedsmen to attribute a larger percentage of doubleness to their strains than actually occurs.—*F. J. C.*

Stone Fruits, Fungoid Diseases of. By G. P. Darnell-Smith and E. Mackinnon (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 589–598; 11 figs.).—Peach Leaf Curl is caused by the fungus *Exoascus deformans*, which attacks the fruit as well as the leaves. To prevent the attack of this pest, spray with Bordeaux mixture just before the buds open.

Brown Rot is the cause of much damage to peaches, plums, cherries, and nectarines. It is due to the fungi *Sclerotinia cinerea* and *S. fructigena*. The fungus not only attacks the fruit but also the branches, producing canker. To prevent the ravages of this disease, spray with Bordeaux mixture before the buds open, with lime-sulphur three weeks after the petals have fallen, and a third time with lime-sulphur about a month before the fruit ripens. Lead arsenate may be added to the spraying solution to destroy leaf-eating insects. Prune out all dead wood and burn all mummied fruit.—*S. E. W.*

Strawberries, To Force. By M. Bultel (*Jour. Soc. Nat. Hort. Fr.* March 1914, p. 163; figs.).—Further experiments seem to prove conclusively that there is really nothing to choose in the matter of efficacity between the two processes of etherization and of immersion in hot water in forcing strawberries, and that both have a marked effect in hastening the maturity of the crop. Comparative tables of the results of experiments are here given.—*M. L. H.*

Strawberry, New (*Le Jard.* vol. xxix. p. 237; 1 fig.).—'Mme. Henri Leduc' is a large round strawberry, resulting from a cross between 'Monseigneur Fournier' and 'Noble.' The fruit is dark red and is sweet.—*S. E. W.*

Strawberry Pests. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 133–137; 1 plate).—The Flower Weevil (*Anthonomus signatus*) lays its eggs in the flower-buds. The larvæ devour the pollen and prevent the formation of fruit. The Strawberry Root Weevil (*Otiorhynchus ovatus*) does much damage in British Columbia by eating-off the roots of the plants. The beetles may be trapped by placing flat pieces of board in the beds. The Crown Weevil

(*Praepodius amabilis*) is a large weevil, common in North America. It lays its eggs on the crown of the plant and the grubs gnaw their way down to the roots. The infested plants must be dug up and destroyed. A small weevil (*Tyloderma fragariae*) has habits similar to the above. "Buttoning" or "Strawberry Blight" is caused by black thrips. The larvae of the Sawfly (*Emphytus maculatus*) eat the leaves of the plants. They are killed by spraying with lead arsenate. The Strawberry Weevil (*Rhinaria perdix*) lays its eggs in the centre of the plant and the larvae bore into the woody tissue. Trap the beetles under pieces of board. Dig up infested plants. The Shining Cockchafer (*Anoplognathus analis*) lays its eggs in the soil. The larvæ feed on the roots of the plants. Dressings with kainit or sodium nitrate damage the larvae and also promote the growth of the rootlets. Carabid Beetles attack the ripe fruit. They may be caught in tins sunk in the ground. The ripe strawberries are also attacked by the Harlequin Fruit Bug (*Dindymus versicolor*), the Brown Ground Bug (*Dictyotus plebejus*), the Rutherglen Bug (*Nysius vinitor*), and the Coon Bug (*Oxycarenus lectularius*). Spraying has no effect on these pests, but they may be driven away by passing clouds of smoke over the strawberry beds.—*S. E. W.*

Strawberry-Clover Seed. By W. M. Carne (*Agr. Gaz. N.S.W.* vol. xxvi. pp. 313, 314).—The germination of Strawberry Clover seed may be greatly increased by placing the seed on a flat stone slab and passing over it a piece of stone about 2 lb. in weight, without pressure.—*S. E. W.*

Streptocarpus × Taylori (*Gard. Chron.* Nov. 6, 1916, p. 293; with fig.).—A handsome plant producing 6–10 inflorescences, each carrying 10–20 flowers, chiefly rose-mauve. The parentage is *S. achimeniflorus albus* × *S. denticulatus* ♂. It was raised at Kew.—*E. A. B.*

Streptocarpus denticulatus (*Bot. Mag.* tab. 8632).—Transvaal. Family *Gesneriaceae*. Tribe *Cyrtandreae*. Herb, stemless, with one leaf, which is an enlarged persistent cotyledon, ovate, 8 in. long by 7 in. wide, glabrous. Inflorescence clustered, many-flowered, 9–10 in. in height. Corolla rose-purple, ¾ in. across.
G. H.

Sugar Beet, Phoma Betae on the Leaves of. By V. W. Pool and M. B. McKay (*Jour. Agr. Res.* iv. pp. 169–177, May 1915; plates).—The identity of this fungus with *Phyllosticta Betae* and *P. tabifica* is pointed out. Light-brown spots, sometimes showing concentric rings of growth, are produced on beet foliage. The seed appears to provide the most usual means of disseminating the fungus.
F. J. C.

Sugar Beets, Seedling Diseases of, and their Relation to Root-rot and Crown-rot. By H. A. Edson (*Jour. Agr. Res.* iv. pp. 135–168, May 1915; plates).—The author finds *Phoma Betae* a troublesome fungus attacking roots of beet; it is identical with *Phyllosticta Betae*, but this leaf form does comparatively little damage. The source of original infection is usually the seed. Under favourable conditions of cultivation plants attacked by this fungus or *Rhizoctonia* may recover, but the other two fungi mentioned below usually bring about fatal results. When the Phoma attack, which occurs primarily in the seedling stage, is arrested the fungus remains dormant in the host, but it occasionally develops a black rot of the growing beets and more frequently appears in the store. If the root is not destroyed the seed-stalk and the mature seed may both be infected. Cultural conditions suitable to the host, and seed treatment to secure fungus-free seeds, are the best methods of dealing with the trouble. *Pythium Debaryanum* attacks young roots throughout the vegetative period, but seedlings still in the seed may be attacked and typical damping off may be produced. *Rhizoctonia* sp. (= *Corticium vagum* var. *Solani*?) produces a form of disease unknown in Europe, but causes a root-rot of economic importance in America, where the conditions of climate and cultivation appear to favour it. The fungus appears to be identical with the *Rhizoctonia* (= *Hypochnus Solani*) which attacks potatos in England, but beet is not known to be attacked by that fungus here. An undescribed species of fungus belonging to the Saprolegniaceae was found causing damping off of young seedlings. This fungus has been referred to by the author as *Aphanomyces laevis*, but he now points out that it differs morphologically from that fungus. *Rhizopus nigricans* does not attack actively-growing beets, but dormant beets and dead tissue are likely to be attacked, and a peculiar light-brown decay, flabbiness, and the formation of pockets filled with an almost colourless fluid rich in acetic acid are then produced.—*F. J. C.*

Sugar-beet Seedlings and Phoma Betae. By H. A. Edson (*Jour. Agr. Res.* v. pp. 55–57, Oct. 4, 1915; plates).—The author has shown that most sugar-beet seeds are likely to be infected with the fungus *Phoma Betae*. He now finds that the

fungus mycelium may persist in the cells of the host for a considerable time without doing any appreciable harm to it, so long as the cultural conditions are suitable for the sugar-beet.—*F. J. C.*

Sugar-beet Wire-worm, A Preliminary Report on the. By John E. Graf (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 123, February 1914; 23 plates, 9 figs.).—Little is at present known with certainty of the life-history of this destructive pest, and the bulletin is a preliminary report of investigations carried on since 1909. The life-cycle of the sugar-beet wire-worm (*Limonius californicus* Mannh.) probably covers about four years. About one month each is required for the egg and pupal stages; seven to nine months for the adult stage, during the greater part of which the beetle is in hibernation; and about three years for the larval stage.—*V. G. J.*

Sulphur, Mechanism of the Fertilizing Action of. By E. Boullanger and M. Dujardin (*Rev. Hort. d'Alg.* No. 11, Nov. 1913, p. 426).—In a preceding note one of these authors has already demonstrated that flour of sulphur applied in very small doses to pot plants exercises a markedly favourable influence on the growth of the plants, this influence, however, being scarcely noticeable if the soil has been previously sterilized. This points to the fact that the sulphur acts only indirectly by arousing the activities of certain useful microbes in the soil.

This article gives the results of experiments undertaken with the view of elucidating this question. They seem to establish the fact that the favourable effect of the flour of sulphur is due to the stimulating influence which it exerts on the bacteria which convert complex nitrogenous matter into ammonia and also on the nitrifying ferments. The plant finds, in consequence of the presence of sulphur, a larger quantity of directly assimilable ammoniacal salts, but the sulphur merely sets free the ammonia, which is derived exclusively from the nitrogenous elements in the soil, and must be provided by added organic manure. *M. L. H.*

Tensions in Stem-tissues. By F. C. Gates (*Bot. Gaz.* lx. p. 235).—The author has made some interesting experiments on the tissues of *Amorphophallus*. Taking portions of the stem-like petiole, a strip of the cortex, and the entirely stripped pith, he found the former contracted 2·0 per cent. when partly flaccid and 1·0 per cent. when turgid; while the pith increased 5·3 per cent. in the first case and upwards of 8 per cent. in the latter. Sachs long ago showed that tensions of a dicotyledonous stem were similar, observing "only an extremely dilute solution capable of causing endosmose can be present, and that this nevertheless [*i.e.* in cut lengths] causes a very pronounced absorption of water, turgescence, and growth" (*Physiology of Plants*, p. 573). It would seem that these tensions may play an important part in the ascent of sap by distension and compression forcing water into the sap-tubes.—*G. H.*

Thunbergia Gibsonii (*Bot. Mag.* tab. 8604).—Tropical East Africa. Family *Acanthaceae*. Tribe *Thunbergieae*. Herb, perennial, twining, 4–5 ft. high. Leaves ovate, base cordate-sagittate, 3 in. long. Corolla-tube curved, 1½ in. long. Petal lobes 2 in. across, orange.—*G. H.*

Tillandsia regina (*Bot. Mag.* tab. 8596).—Brazil. Family *Bromeliaceae*: Tribe *Tillandsieae*. Herb of large size, stemless. Leaves about 30, rosulate, 3½–4½ ft. long. Peduncle, 3½ ft. high, clothed with recurved bracts. Panicle 3½ ft. long; bracts having rose-coloured margins. Petals 3½ in. long, white or yellow.—*G. H.*

Tobacco Insects in Hawaii. By D. T. Fullaway (*U.S.A. Dep. Agr., Hawaii Exp. Stn., Bull.* 34, May 1914; 9 figs.).—The principal tobacco pests are cut-worms, split-worm, pod-borer, horn-worm, flea-beetle, and cigarette-beetle. Many minor pests are encountered, some affecting the plant and some the product.

The cigarette-beetle (*Lasioderma serricorne*) attacks the stored product, and the usual method of control is fumigation with carbon bisulphide and hydrocyanic gas.—*V. G. J.*

Tobacco Split-worm, The. By A. C. Morgan and S. E. Crumb (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 59 (professional paper), January 1914; 3 tables).—This account of the tobacco split-worm (*Phthorimoea operculella* Zeller), although not complete, contains data not heretofore published.—*V. G. J.*

Tobacco Wire-worm in Virginia, The so-called. By G. A. Runner (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 78; May 1914 (professional paper); 2 plates, 9 tables).—Injury only occurs where susceptible plants are grown on weedy land.

Tobacco or corn planted on land which has been under clean cultivation the previous year, and kept free from weeds which live throughout the winter, does not suffer serious injury.

The larvæ cannot live through the winter in the soil from the previous summer unless plants on which they are able to feed are present. Experiments show that the most effective method of control consists of eradicating such weeds as buckhorn, plantain, daisy, stickweed, &c.—*V. G. J.*

Tomatos in the Southern States. By H. C. Thompson (*U.S.A. Dep. Agr., Bull.* 642, 13 pp.; 9 figs.).—The following varieties of Tomato are recommended for growing for market: Bonny Best, Chalk's Early Jewel, Greater Baltimore, Red Rock, Globe, Favourite, Acme, and Stone. Sparks' Earliana is one of the best earlies for local consumption. Stone and other deep red varieties have a ready sale for canning. Tomatos should not be planted on any plot that has in the previous year grown a crop affected by nematoids. Spray with Bordeaux mixture to prevent the attacks of fungoid diseases.—*S. E. W.*

Transpiration of Emersed Water-plants, Its Measurement and its Relationships. By C. H. Otis (*Bot. Gaz.* vol. lviii. p. 457).—This long paper of 38 pages, including 14 "charts," has for its object to discover the difference between the *transpiration* from the plants and the evaporation from the surface of the water. In the section on "The Relation of certain Physical Factors to Transpiration," the following are alluded to: Temperature, relative humidity, wind. A most extraordinary omission is *light*.

One of the conclusions in the "Summary" is that "Transpiration from emersed water-plant surfaces occurs both by day and night, but transpiration by day is greatly in excess of that by night."—*G. H.*

Tree Fillings and Wound Dressings for Orchard and Shade Trees. By A. D. Selby (*Ohio Agr. Exp. Stn., Circ.* 150; January 11, 1915).—Materials: Dry sawdust of any variety, and solid asphaltum such as 'Byerlyte' and that used for fillings in brick pavements.

For Cavities in Swaying Branches.—One part asphaltum to 3 to 4 parts sawdust. Moisten tools in Varnolene or possibly in crude oil. See below.

For Cavities in Trunks.—One part asphaltum to 5 to 6 parts of sawdust. Moisten tools with Varnolene or crude oil. Stir sawdust into hot melted asphaltum until desired consistency is reached. Distribute sawdust, as added, evenly over surface of vessel to avoid boiling over. Apply in cavities while still hot. No joints or sheet paper separations are required as in cement fillings. If surfaces of fillings are irregular or lack uniformity of colour, coat them with gas tar or liquid asphaltum.

Gas Tar and Liquid Asphaltum.—Experience has recently shown the practical value of gas tar and forms of liquid asphaltum as wound dressings. The relatively low cost of the gas tar, 15 to 20 cents a gallon, and certain of its qualities, render it adapted to use for wound dressings.—*A. D. W.*

Tree Surgery, Practical. By J. Franklin Collins (*U.S.A. Dep. Agr. Year Book* 1913, separate 622, pp. 162-190; 7 plates).—This describes the various methods for preserving old and valuable trees against decay. For the filling up of large cavities in trees, it is recommended to remove completely the decayed wood and then to sterilize with creosote or hot asphalt; afterwards to fill the cavity with a good grade of Portland cement. Various asphalt mixtures are also of great value in filling up cavities.

This can be safely undertaken only when the sap is not running too freely, as then the cambium is less active and less liable to injury.—*A. B.*

Tropaeolum tricolor. By J. Rudolph (*Le Jard.* vol. xxix. p. 274).—*Tropaeolum tricolor* is a dwarf variety from Chile, with flowers having a scarlet tube, orange centre, and black tips. The bulbs are grown in a cool house, in a compost consisting of equal parts of loam, sand, and peat. It can be propagated from cuttings. In autumn the plants are dried off and the tubers replanted in March.—*S. E. W.*

Turnip Gall Weevil. Anon. (*Jour. Bd. Agr.* xxii. No. 9, Dec. 1915; 5 figs.).—The Turnip Gall Weevil is at times a source of considerable loss to turnip and cabbage crops, but its presence is not always recognized owing to its likeness to the fungus injury known as "finger and toe." The weevil causes a gall or swelling, in which the larval period is passed. Descriptions and figures are given of larva, pupa, and adult, while the life-history, distribution, and methods of control are dealt with fully. (The article has since appeared as a leaflet.)
G. C. G.

Violet Leaf-spot. By M. D. (*Irish Gard.* xi. p. 5; Jan. 1916).—White spots, round, with definite margins, occur on violet leaves, due to *Phyllosticta Violae*. Recommends picking and burning foliage at the first onset of the disease, and spraying with potassium sulphide.—*F. J. C.*

Walnut Aphides in California. By W. M. Davidson (*U.S.A. Dep. Agr., Bull.* 100, August 31, 1914).—The life-history of walnut aphides in California is briefly as follows :—A week or so before the buds open on the trees in the spring, the aphides begin to hatch from the winter eggs. As soon as the young foliage appears the "lice" settle on it, and after feeding for a month or so become adults. These stem mothers are always winged, and, like plant lice of later generations, are capable of migrating to other trees and orchards. As soon as they are fully developed they produce young parthenogenetically. These second-generation young become mature in three weeks and in turn produce young. The individuals of the third and subsequent generations of summer mature in about sixteen days.

In general the aphides inhabit the underside of the leaves, but those of the second, third, and fourth generations often attack the nuts, sometimes seriously dwarfing them. Occasionally the "lice" will be found on the upper surface of the leaf. When infestation on the leaves and nuts is severe, the vitality of the infested tree is impaired. The aphides excrete a sweet, gummy, transparent substance much sought after by ants, and in this thrives a black, sooty fungus. This black fungus often covers the upper sides of the lower leaves and the upper part of the nuts, thereby interfering with the respiratory action of the plant tissues.

Aphides on walnuts can be controlled artificially with sprays. The winter spraying directed against the eggs is the easier to apply, and high trees can be reached by a winter wash with ease, whereas in the spring and summer so thick is the foliage that a thorough application is hard to accomplish satisfactorily. Furthermore, far less material is required when the trees are bare. Lime-sulphur and crude-oil emulsions are effective, especially the first named. The spray should be directed all over limbs and twigs, so as to cover every part.—*A. D. W.*

Wetting, The Theory of, and the Determination of the Wetting Power of Dipping and Spraying Fluids. By W. F. Cooper and W. H. Nuttall (*Jour. Agr. Sci.* vii. Part 2, pp. 218–239; Sept. 1915).—The authors review the literature of the subject and give an outline account of the physical principles involved. They have conducted numerous experiments for comparing the wetting power of a number of spraying and dipping fluids, and finally arrive at the conclusion that the most useful method is that devised by Donnan (*Zeitschrift f. Phys. Chem.* xxxi. pp. 42–49, 1899), which consists essentially in counting the number of drops formed by a definite volume of a thick paraffin (the authors use liquid vaseline) allowed to escape from a pipette dipping in succession into (*a*) distilled water, (*b*) the spraying solutions under examination. The method is applicable only to preparations containing soap as a basis. An interesting paper, whose usefulness is increased by the appended references to previous literature.
J. E. W. E. H.

ERRATA AND CORRIGENDA.

Page 30,	line	3	from bottom, for Gnat moth read Goat moth.
,, 162	,,	5	,, ,, ,, £11 3s. read £1 13s.
,, 170	,,	9	,, ,, ,, *ribicola* read *ribicolum*.
,, 205	,,	7	,, ,, ,, *Mackii* read *Maackii*.
,, 206	,,	30	for *Strobilanthus* read *Strobilanthes*.
	,,	13	from bottom, for *Dalavayi* read *Delavayi*.
,, 376	,,	3	for *evert* read *erect*.
	,,	12	,, *Thompsonianum* read *Thomsonianum*.
,, xlv	,,	31	and 32 for *C* read *N*.
,, xlvii	,,	15	for *Coreus* read *Cereus*.
,, cxvi	,,	37	,, *Taylor* read *Tayler*.
,, cxxxii	,,	26	,, *Cydonia Mallardii* read *Pyrus japonica Wilsonii*.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 5, 1915.

Sir HARRY J. VEITCH, F.L.S., V.M.H., in the Chair.

Fellows elected (17).—W. E. Beard, C. Hall Betts, LL.D., F.S.P., G. Clark, Trevor T. Edwards, G. A. Fickling, Miss E. A. Fox, Mrs. A. Harbord, Miss Hornby, Miss M. Hornby, W. Rees Jones, E. Layman, J. McCullock, Miss O. E. Rawson, Mrs. Reader, F. L. Shackleton, P. Waterlow, A. G. Winfield.

Associate (1).—J. W. Allen.

Society affiliated (1).—Waltham Cross Research Station.

GENERAL MEETING.

JANUARY 19, 1915.

Col. Rt. Hon. MARK LOCKWOOD in the Chair.

Fellows elected (19).—A. L. Albrecht, C. W. Bartholomew, Mrs. C. W. Bartholomew, Rev. C. G. O. Bond, Miss G. Burnett, Mrs. Chambers, H. Crum Ewing of Strathleven, A. C. Finch Hill, Miss H. M. Hookey, Miss M. F. McEwen, Alex. Macrae, Lieut.-Col. D. O. Morris, C. F. Nash, Mrs. E. J. Owen, P. D. Poole, Miss B. Stewart, Mrs. Waterfield, Mrs. P. L. Waterhouse, R. A. Witty.

Associate (1).—George Williams.

GENERAL MEETING.

FEBRUARY 2, 1915.

Mr. EDWARD A. BUNYARD, F.L.S., in the Chair.

Fellows elected (25).—Evelyn, Countess of Annesley, Mrs. B. Bathurst, H. G. Bell, R. L. C. Borrett, S. W. McLeod Braggins, The Duchess of Buccleuch, Miss M. E. Cocking, Mrs. Cramer, H. Doyle, Mrs. Pritchard Gordon, Count Gurowski, Mrs. S. R. Hollick, Dr. M. Lacroze, Eric P. Laird, R. F. Lambe, H. Lawson, C. A. Lowenadler,

Mrs. McComas, E. B. Milner, Mrs. G. A. Phillips, Mrs. A. Strahan, M. M. Tannenbaum, Miss A. Welch, Mrs. W. E. White, Mrs. A. Whitworth.

Fellows resident abroad (3).—Norman T. Baker (Johannesburg), Prof. A. P. W. Thomas (Auckland, N.Z.), J. B. Willoughby (Brighton, Canada).

Associates (5).—Miss A. B. Lindsay, S. Frankland Phillips, E. Swinden, J. H. Watchorn, James Wells.

Society affiliated (1).—Gresford Rose Society.

A lecture on "Keeping Orchards Clean" was given by Prof. H. Maxwell Lefroy, F.Z.S., F.E.S. (see p. 28).

ANNUAL GENERAL MEETING.

FEBRUARY 9, 1915.

Sir HARRY J. VEITCH, F.L.S., V.M.H., in the Chair.

The minutes of the Annual Meeting of February 10, 1914, were read and signed.

Fellows elected (11).—Mrs. Bacchus, G. M. Ballhardie, Mrs. J. A. G. Campbell, A. Clements, J Edge-Partington, J. A. Jarrett, T. R. Estall Lewis, Miss McCarthy, A. McIlwraith, P. A. Skinner, W. Thorley.

Society affiliated (1).—Heston Horticultural Society.

The Chairman moved the adoption of the Annual Report. This was seconded by the Treasurer and carried.

The following names of President, Vice-Presidents, the Members of Council, and Officers having been duly proposed and seconded, and the list sent round in accordance with Bye-law 74, and no alternative names having been proposed, they were declared to be elected by the Council:

As Officers.—Field-Marshal The Right Hon. Lord Grenfell, G.C.B., G.C.M.G. (*President*), Mr. J. Gurney Fowler (*Treasurer*); The Rev. W. Wilks, M.A., V.M.H. (*Secretary*), Mr. Alfred C. Harper (*Auditor*).

As New Members of Council.—Lord Balfour of Burleigh, K.T., G.C.M.G., Sir Albert Rollit, D.C.L., Litt.D., Mr. James Hudson, V.M.H.

As Vice-Presidents.—The Duke of Bedford, K.G., F.R.S., The Rt. Hon. The Earl of Ducie, F.R.S., The Rt. Hon. Lord Rothschild, Leopold de Rothschild, Esq., C.V.O., Sir John T. Dillwyn-Llewelyn, Bt., D.L., J.P., V.M.H.

The following Resolution was proposed by Sir Harry Veitch, seconded by Mr. James O'Brien, and carried unanimously:

"That the Fellows of the Royal Horticultural Society at their Annual Meeting of this the 9th day of February 1915 desire to express their deep and fraternal sympathy with the grievous losses suffered in the course of the present war by the horticulturists of Belgium and Northern France, and that they hereby request the President and

Council to initiate and subscribe towards a fund to aid in the restoration of Belgian and French horticulture upon the conclusion of hostilities."

V.M.H. Medals and Certificates were presented to Captain W. Stackhouse Pinwill, Mr. J. Cheal, Mr. W. Cuthbertson, and Mr. J. Whytock.

Sir John T. D. Llewelyn then proposed a vote of thanks to the Chairman, which was seconded by Mr. James O'Brien, and carried with acclamation.

REPORT OF THE COUNCIL TO THE ONE HUNDRED AND ELEVENTH ANNUAL GENERAL MEETING OF THE SOCIETY TO BE HELD AT THE ROYAL HORTICULTURAL HALL AT 3 P.M. ON TUESDAY FEBRUARY 9TH, 1915.

1. **Effect of the War.**—The year 1914 opened with very bright prospects for our Society, and acting upon the Resolution passed by the Fellows at the last Annual Meeting, the Council at once applied themselves to the further improvement of the gardens at Wisley and the development of the Horticultural Research Station and School of Gardening. An additional staff of officials was appointed, and contracts for buildings, &c., were entered into before the beginning of August, when the storm clouds of war burst so suddenly upon us, inflicting grievous loss and financial strain, not only upon our country, but upon our Society also. The increase of Fellows, which in recent years has stood at about 452 for the last five months of the year, has fallen to less than 200, entailing a loss of permanent income of some £500 a year. The lettings of the Hall since August on days when the Society was not actually using it, have fallen by £600, and various other smaller sources of revenue have fallen in like manner. Thus expenses have unavoidably increased in all departments whilst income has at the same time decreased, so that had it not been for the policy pursued consistently since 1887, of investing the Society's annual balance of revenue instead of spending it, the Council would not have been able to face the present troubles with the confidence they now feel, nor to meet the heavy expenditure to which the Society was committed before there was any mention of war. They, therefore, earnestly appeal to all their supporters to do their utmost to keep the List of Fellows up to the number reached in 1914, when 14,400 names were inscribed upon it.

It should be clearly understood that the income from the invested funds of the Society is insufficient to meet the annual expenditure even when this is reduced to the lowest possible figure. The Council rely with confidence on the support of the Fellows being accorded to them in the future as it has been in the past, so that the good work of the Society may be in no way abated.

2. **Staff Enlisted.**—As a proof of the share the Society has taken in matters more immediately connected with the war, it may be mentioned that no less than 25 members of the staff have enlisted or joined the Territorial Battalions to which they had previously belonged, most of them being now on active service abroad. All of them are receiving half-pay from the Society, and their posts will, as far as possible, be kept open for them.

3. **Care of Food Committee.**—On the outbreak of war a Committee was at once appointed to consider how the food needs of the country stood so far as horticulture was concerned. As a result, an appeal was made by means of letters in the daily newspapers and by the despatch of no fewer than 50,000 circulars, urging all who had vacant patches of land to sow or plant them with certain vegetables mentioned, with a view of meeting any shortage which might occur in the winter and early spring. Many thousands of plants were also distributed through the Society's agency, and the Council has had the satisfaction of learning that this action was taken up with enthusiasm all over the country, and that many valuable additions have in consequence been made to the general stock of winter vegetables. A permanent result, it is hoped, will also issue from this, most people being previously unaware that such vegetables could be sown or planted so late as the first week in August and yet produce considerable returns.

4. **Wisley Development.**—At the Annual Meeting in February 1914 it was explained that a Committee of eminent scientific and practical horticulturists had been appointed by the Council to consider how the Society's work at Wisley should be extended. The recommendations of these experts were presented to the Council in the form of a Report, which urged that steps should be taken at once to make Wisley the foremost horticultural institution in the world, with a more complete equipment, including laboratories for scientific research and experimental work, and an increased staff of men of the highest possible qualifications for the particular work entrusted to each. To do this thoroughly, the Report estimated would involve an expenditure of at least £2,500 a year, besides the further capital outlay on buildings, and if these additional responsibilities were to be undertaken there was urgent need (as was explained to the meeting) for the formation of a Trust, so that, once taken in hand, the work might be independent of any future fluctuations in the Society's finances. The Meeting thereupon passed the following resolution:—"That the Council of the Society be requested to create a special Trust Fund to carry on and augment the Society's work at Wisley, and that part of the present invested funds of the Society be allocated to that purpose."

An Endowment Trust of £25,000 was accordingly founded, and it was hoped to be able to devote to it a sum not exceeding £5,000 a year until the independent maintenance of Wisley is for ever secured.

To be able to do this, as stated in paragraph 1, it is urgently imperative that there be no falling off in Fellows' subscriptions or other revenues of the Society.

5. **Dr. Keeble appointed Director.**—The Council have been fortunate in securing the services of Dr. Frederick Keeble, F.R.S., formerly of University College, Reading, as Director of the Gardens. Under his supervision, the developments outlined in the Experts' Report have already made considerable progress.

6. **Entomologist and Chemist.**—To supplement the assistance given by Mr. Chittenden, F.L.S., and Mr. Horne, D.Sc., who have already done much useful experimental work at Wisley, Professor H. Maxwell Lefroy, F.Z.S., F.E.S., Lecturer at the Imperial College of Science, has been appointed Entomologist, and Mr. Harold J. Page, B.Sc., from University College, London, and the Pasteur Institute, Paris, has been appointed Chemist. Mr. Page is at present with the Army in France, but will join the staff immediately on his return.

7. **The Imperial College.**—On Professor Maxwell Lefroy's appointment as Entomologist, an arrangement was entered into with the Imperial College of Science and Technology constituting the Wisley Gardens the joint Experimental Entomological Station of the Society and of the Imperial College. The Society thus establishes close working relationship with the leading Government College of Science, which all will feel to be a step in the right direction.

8. **New Laboratory.**—The erection of the new buildings is already well in hand, and on their completion the Council believe that the Society will possess laboratories superior in every respect to those of any other similar institution in the world. It is hoped that the buildings will be completed in time to be opened in the early autumn of 1915.

9. **Trials.**—Acting on the advice of the Experts Committee, the staff at Wisley has devoted considerable attention to the more thorough organization of the Trials. The Rules have been revised (see p. 42 "Book of Arrangements, 1915"), and a Trials Officer has been appointed, who will devote the whole of his time to their supervision.

10. **New Cottages.**—Last spring, the inconvenience to the surrounding parishes of the insufficient housing accommodation in Wisley for the labouring members of the Society's staff was made known by the Guildford Rural District Council. They have had, until now, to live in the neighbouring villages which are consequently overcrowded to an almost intolerable extent. A plot of land has therefore been purchased from the Countess of Lovelace, and designs for half a dozen cottages are already in hand.

11. **Diploma Examinations.**—The first Examinations in connexion with the National Diploma in Horticulture, established last year in co-operation with the Department of Agriculture, were held in June. Sixty-three candidates entered for the Preliminary Examination, of whom 42 passed. The Society is under a great debt of gratitude to the late Duke of Buccleuch, K.G., K.T., The Marquis of Huntly, P.C., The Earl of Ellesmere, and Reginald Cory, Esq., for kindly lending their gardens for the Examinations.

12. **Degree in Horticulture.**—A scheme for the establishment of a Degree in Horticulture has been submitted to the Senate of the University of London for consideration.

13. **Saxifrage Conference.**—The Saxifrage Conference, of which notice was given in last year's Annual Report, has been postponed owing to the War.

14. **Douglas Journal.**—The anticipations of the last Annual Report that the *Douglas Journal* would be published during the early summer were not realized. At the last moment further manuscript was discovered in turning out an old long-forgotten box, and it was thought well to include this. The last proofs were passed for Press at the beginning of November, and the work can now be obtained from Messrs. Wesley & Sons, 28 Essex Street, Strand, W.C., price £1 1*s.*

15. **Tulip Nomenclature.**—The first stage in the Trial of Tulips for the verification of nomenclature was completed in May last, when over 4,000 varieties were examined and their nomenclature and synonyms determined by a joint Committee of Dutch and English Experts. The Trials are being continued in 1915, and the conclusions will be drawn up after the final meeting of the Committee on May 13 and 14, 1915. The Committee are framing a simple classification of Tulips for garden purposes.

16. **Dahlia Trial.**—A further trial of Decorative Garden Dahlias was held at Duffryn, Cardiff, in September, through the kindness of Mr. Reginald Cory, to whom the thanks of the Society are due for the valuable service thus rendered. No fewer than two hundred and forty varieties were grown. The report of the Judges will be found in the Society's JOURNAL, vol. xl. part 3.

17. **Dahlia Show.**—The Council have arranged for an Exhibition of Dahlias to be held on September 14, 1915, jointly with the National Dahlia Society.

18. **Parliamentary Committee.**—The Memorandum from the Society on Railway Rates for horticultural produce is still before the

Railway Commission, whose deliberations are suspended for the time being owing to the War. The Committee has also had under careful consideration the proposals introduced last spring at the International Congress at Rome (*a*) to prevent the spread of plant pests from one country to another, and (*b*) to provide for co-operation in fighting them where they occur. As it is thought that the proposals may in some respects hamper important branches of the Horticultural trade, the Council have referred the matter to the Parliamentary Committee for consideration.

19. **Hours of Closing Fortnightly Meetings.**—In response to applications received from the City it was decided to keep the Fortnightly Meetings of the Society open for an hour later during 1914, but the sparse attendance after the usual hour led to a protest from Exhibitors. Consequently the times of opening and closing in 1915 will revert to the former use, viz. :—1 to 5 in January, November, and December, and 1 to 6 from February to October, inclusive.

20. **Deputations.**—A Deputation attended the Bournemouth Horticultural Society's Show on November 10. The Show at Carlisle fixed for August, which the Council had arranged to visit, was postponed on account of the War.

21. **The Lawrence Medal.**—The Lawrence Medal for 1914 has been awarded to Sir Everard Hambro, Bt., for the excellent cultivation and staging of Saxifrages and Rock Plants, on March 10.

22. **Victoria Medal of Honour.**—The Victoria Medal of Honour has been conferred upon the following :—Mr. Joseph Cheal, of Crawley ; Mr. W. Cuthbertson, of Edinburgh ; Captain W. Stackhouse C. Pinwill, of Cornwall ; and Mr. James Whytock, Dalkeith Gardens.

23. **Use of "F.R.H.S."**—From time to time report has been conveyed to the Council that certain unscrupulous persons were advertising themselves to the public as Fellows of the Society by appending to their names the letters "F.R.H.S." when they either never had been Fellows or had ceased to be so.

A case of this kind was recently brought to the notice of the Council, and the offender on being remonstrated with first of all refused to desist and then became abusive, but when legal proceedings were threatened he undertook to discontinue the use of the letters "F.R.H.S." altogether.

After the lapse of several months, however, he was found still to be making use of the letters for business purposes. The Council thereupon at once applied for and obtained an injunction against him in the Chancery Division of the High Court restraining him from using

on his notepaper, or in notices, circulars, or advertisements, or otherwise in connexion with his business as a manufacturer of horticultural sundries, the letters "F.R.H.S." in such a way as to represent or lead the public to believe that he is a Fellow of the Society; and he was condemned in the costs of the action.

If his offence should be again repeated he would render himself liable to be imprisoned for "Contempt of Court."

The Council are determined to take a like course in all similar cases which may be brought to their notice, as they regard the false representation of oneself to be what one is not, for the purpose of deceiving the unwary, highly fraudulent.

24. **Obituary.**—It is with regret that the Council have to record the death of the following Fellows:—The Earl of Clarendon; Lord Ventry; Viscount Cross, G.C.B.; The Rt. Hon. Joseph Chamberlain—one of our Vice-Presidents; The Master of Kinloss; Sir John Ramsden, Bt.; Dr. M. C. Cooke, V.M.H.; W. Iggulden, Esq.; C. P. Little, Esq.; J. Gould Veitch, Esq.; Messrs. Henry Cannell, V.M.H.; George Cuthbert; George Dickson, V.M.H.; George Gordon, V.M.H.; and Mrs. T. B. Haywood.

25. **Annual Progress.**—The following table shows the Society's progress in regard to numerical strength during the past year:

LOSS BY DEATH IN 1914.

		£	s.	d.
Life Fellows	8	0	0	0
4 Guineas	5	21	0	0
2 "	75	157	10	0
1 Guinea	60	63	0	0
	148	£241	10	0

LOSS BY RESIGNATION, &c.

		£	s.	d.
4 Guineas	2	8	8	0
2 "	340	714	0	0
1 Guinea	540	567	0	0
Associates	40	21	0	0
Affiliated Societies	14	14	14	0
	936	£1,325	2	0
TOTAL LOSS	1,084	£1,566	12	0

FELLOWS ELECTED IN 1914.

		£	s.	d.
4 Guineas	5	21	0	0
2 "	631	1,325	2	0
1 Guinea	620	651	0	0
Associates	48	25	4	0
Affiliated Societies	20	21	0	0
Commutations = £355 8s. 6d.	17			
	1,341	£2,043	6	0
Deduct Loss		1,566	12	0
NET INCREASE IN INCOME		£476	14	0

New Fellows &c.	1,341
Deaths and Resignations	1,084
NUMERICAL INCREASE	257
Total on December 31, 1913	14,147
Total on December 31, 1914	14,404

26. **Committees &c.**—The Society owes a constantly recurring debt to the Members of the Standing and Special Committees, Chairmen, Judges, Writers of Papers for the JOURNAL, Compilers of Abstracts, Reviewers, Lecturers, and the several Examiners, who, during the past twelve months, have done so much to contribute to the Society's

usefulness, and to help to maintain its high standing among the practical and scientific institutions of the world.

The Council also acknowledge their obligations to their staff, and to the Press for their invaluable assistance in reporting upon, and calling attention to, the work of the Society.

By Order of the Council,

W. WILKS,

Secretary.

ROYAL HORTICULTURAL SOCIETY,
VINCENT SQUARE, WESTMINSTER, S.W.
January 1, 1915.

Dr. **ANNUAL REVENUE & EXPENDITURE ACCOUNT**

	£ s. d.	£ s. d.
To ESTABLISHMENT EXPENSES—		
Ground Rent	690 0 0	
Rates and Taxes	506 15 11	
Water Rate	72 6 9	
Electric Light	197 6 4	
Gas	27 1 2	
		1,493 10 2
Salaries and Wages	2,271 19 6	
Printing and Stationery	1,550 5 10	
Postages	640 2 8	
Fuel	58 12 0	
Professional Fees	194 0 8	
Gratuities	35 0 0	
Repairs and Renewals (including £150 for Hall Painting)	407 1 9	
Miscellaneous Expenses	166 8 4	
		5,323 10 9
,, INSURANCES		63 1 5
,, JOURNAL, PRINTING AND POSTAGE		3,193 9 6
,, WISLEY SCHOLARSHIP, GIVEN BY THE SOCIETY		25 0 0
,, STAFF PENSION	306 5 6	
Less contributed by the Staff, as per scheme	146 9 0	
		159 16 6
,, SHOWS AND MEETINGS—		
Chelsea Show	3,581 15 5	
Holland Park Show	1,625 10 6	
Autumn Vegetable Show	88 12 6	
Labour, Floral Meetings and Conferences	243 16 10	
Expenses, do. do.	57 10 1	
Council, Committee & Deputation Expenses	360 19 8	
Painting Orchid Certificates	37 2 6	
		5,995 7 6
,, INSPECTION OF GARDENS		81 5 6
,, PRIZES AND MEDALS—		
Awarded at Society's Shows	551 10 6	
Do. by Deputation at other Shows	19 1 0	
		570 11 6
,, EXAMINATIONS IN HORTICULTURE—		
Amount expended	362 14 6	
Less received in Fees	331 10 5	
		31 4 1
,, CONTRIBUTION TO LINDLEY LIBRARY		
Purchase of Books	382 8 3	
Expenses	47 11 9	
		430 0 0
,, SPECIAL EXPENDITURE—		
Donation to Pritzel Revision Fund	250 0 0	
Hall Roof Blinds	135 0 0	
Lawrence Album	95 7 6	
Plans for Wisley New Buildings	52 10 0	
		532 17 6
,, DEPRECIATION—		
Hall Glass Roof, Furniture, Appliances for Shows		260 13 2
		18,160 7 7
,, BALANCE, carried to BALANCE SHEET		14,135 12 2
		£32,295 19 9

	£	s.	d.	£	s.	d.
By Annual Subscriptions				21,090	6	0
,, Entrance Fees				339	3	0
,, Dividends and Interest	2483	6	7			
,, Do. do. Davis Trust	49	14	5			
				2,533	1	0
,, Shows and Meetings—						
Chelsea Show	4,065	0	6			
Holland Park Show	1,310	2	5			
Takings at Hall Shows	170	0	5			
				5,545	3	4
,, Journals and other Publications—						
Advertisements	999	17	4			
Sale of Publications	166	4	6			
				1,166	1	10
,, Hall Lettings	1,714	15	3			
Less Labour Expenses	272	14	2			
				1,442	1	1
,, Prizes and Medals				164	8	6
,, Life Compositions—						
Being amount paid by Fellow now deceased				15	15	0
				£32,295	19	9

LIABILITIES.

		£ s. d.	£ s. d.
To CAPITAL FUNDS ACCOUNT—			
As at 31st December, 1913 .	£36,656 19 4		
Less Fees paid by Fellow now deceased . .	15 15 0		
		36,641 4 4	
Transferred from Revenue for Capital purposes		7,310 18 8	
			43,952 3 0
,, LIFE COMPOSITIONS, 1914			355 8 6
,, SUNDRY CREDITORS			638 3 4
,, BANK LOAN			1,000 0 0
,, SUBSCRIPTIONS, &c., paid in advance . . .			309 5 0
,, WISLEY SCHOLARSHIPS—			
Given by the Gardeners' Company, 1914. .	£25 0 0		
Given by the Society .	25 0 0		
		50 0 0	
Less paid to Scholars		30 4 2	
			19 15 10
,, RESERVE ACCOUNT—HALL PAINTING—			
Balance 31st December, 1913 . .		373 13 4	
Added 1914		150 0 0	
			523 13 4
,, DEPRECIATION AND RENEWALS RESERVE ACCOUNT—			
As at 31st December, 1913		1,950 19 8	
Added 1914		260 13 2	
			2,211 12 10
,, LABORATORY PRIZE FUND—			
Donations	£3 0 0		
Dividend (Nicholson Memorial Fund)	6 6 2		
		9 6 2	
Less expended		5 12 0	
			3 14 2
,, WILLIAMS MEMORIAL FUND			16 0 8
,, MASTERS MEMORIAL FUND			11 6 0
,, SCHRÖDER PENSION			9 8 4
,, LINDLEY LIBRARY TRUST			8 0 8
,, PRITZEL REVISION FUND			22 13 10
,, GENERAL REVENUE ACCOUNT—			
Balance, 31st December, 1913 . . .		90,332 5 7	
Deduct—			
Transfer to Capital Fund a/c.	£7,310 18 8		
Wisley Endowment Fund .	25,000 0 0		
Depreciation in Market Value of Securities transferred to Wisley Endowment Fund .	688 7 2		
Assets transferred to Wisley Balance Sheet . .	13,764 8 6		
Bad Debts . . .	52 0 6		
		46,815 14 10	
		43,516 10 9	
,, REVENUE FOR THE YEAR, as per annexed Account . .	14,135 12 2		
Less WISLEY GARDENS, Excess of Expenditure over Revenue	3,728 16 11		
		10,406 15 3	
			53,923 6 0
			£103,004 11 6

ASSETS.

	£ s. d.	£ s. d.
By Capital Expenditure—		
,, New Hall and Offices—		
As at 31st December, 1913	40,950 11 2	
Expenditure since (Fire Sprinkler) . .	327 2 2	
		41,277 13 4
,, Furnishing Hall and Offices—		
As at 31st December, 1913	2,368 6 11	
Expenditure since	96 2 9	
		2,464 9 8
,, Freehold Land at Wisley		210 0 0
		43,952 3 0
,, Appliances for Shows		296 11 0
,, Sundry Debtors and Payments made in Advance		2,594 3 3
,, Investment of Depreciation and Renewal and Reserve Account— 3½% India Stock £2,056 5s. 11d. . *cost* (*The approximate value of this Investment on the 29th July*, 1914, *was* £1,763 13s. 9d.)		1,950 19 8
,, Investments, as per Schedule . *at cost* (*The approximate value of these Investments on the 29th July*, 1914, *was* £43,542 10s. 6d.)		48,868 16 7
,, Bank Bill £5,000 due 12th January, 1915 .		4,995 5 0
,, Cash—		
At Bank	304 7 3	
In Hand	42 5 9	
		346 13 0
		£103,004 11 6

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st Dec., 1914.

ALFRED C. HARPER, *Auditor*
(Harper Brothers & Feather, *Chartered Accountants*),
35 Great Tower Street, London, E.C.

16th January, 1915.

Dr. WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE

		£ s. d.	£ s. d.	£ s. d.
To Salaries—				
Garden	£518 15 0			
Laboratory	1,033 16 10			
		1,552 11 10		
,, Rates and Taxes		105 3 5		
,, Insurances		17 12 3		
,, Labour		1,237 8 8		
,, Garden Implements		116 6 10		
,, Loam and Manure		174 8 9		
,, Repairs		174 6 7		
,, Fuel		237 11 6		
,, Miscellaneous Expenses—				
Garden	218 16 8			
Laboratory	126 13 1			
		345 9 9		
,, Trees and Shrubs, and Rock Garden		9 6 4		
			3,970 5 11	
,, Cost of Growing, Packing and Distribution of Plants to Fellows			299 6 6	
,, Staff Pension		225 19 7		
Less contributed by the Staff, as per scheme		94 15 0		
			131 4 7	
,, Depreciation—				
Glass Houses, Plant and Materials			420 17 9	
			£4,821 14 9	

ACCOUNT FOR YEAR ENDING 31st DECEMBER, 1914. Cr.

	£ s. d.	£ s. d.
By DIVIDENDS AND INTEREST		722 8 11
,, PRODUCE SOLD		88 18 11
,, STUDENTS' FEES		31 10 0
,, EDUCATIONAL GRANT, WISLEY SCHOOL . .		250 0 0
,, BALANCE, being excess of Expenditure over Revenue		3,728 16 11
		£4,821 14 9

LIABILITIES.

	£	s.	d.	£	s.	d.
To Capital Funds Account—						
Amount transferred from R. H. Society				13,764	8	6
,, Endowment Fund—						
Amount transferred from R. H. Society				25,000	0	0
,, Depreciation and Renewals Reserve Account—						
As at 31st December, 1913	£2,351	9	3			
Added, 1914	420	17	9			
				2,772	7	0
				£41,536	15	6

ASSETS.

	£	s.	d.	£	s.	d.	£	s.	d.
By Dwelling Houses— As at 31st December, 1913				5,579	11	10			
,, Glass Houses, Ranges, Potting Shed, &c.— As at 31st December, 1913	£4,897	19	6						
Expenditure since	304	6	6						
				5,202	6	0			
,, Laboratory— As at 31st December, 1913	£1,627	14	11						
Expenditure since	424	10	6						
				2,052	5	5			
							12,834	3	3
N.B.—The Wisley Estates are, under the Trust Deed, vested in the Society only so long as it is in the position to use them as an Experimental Garden. The value of the expenditure thereon depends therefore on the continual use of the Garden by the Society.									
,, Horse and Carts, Garden Plant, &c.				131	8	6			
,, Furniture and Fittings				180	1	3			
,, Fencing and Wire Netting				102	6	9			
,, Scientific Instruments and Fittings, Laboratory				221	6	5			
,, Breakable Apparatus—Do.				95	2	4			
,, Motor Car				200	0	0			
							930	5	3
							13,764	8	6
,, Investment of Depreciation and Renewals Reserve Account, 31st December, 1913— £2,478 7s. 2d. 3½ % India Stock at cost				2,351	9	3			
Add Cash at Bank for Investment, 31st December, 1914				420	17	9			
							2,772	7	0
,, Investments Appropriated to Trust Fund from Royal Horticultural Society Valued as on 7th April, 1914— Great Eastern Railway Company 4 % Debenture Stock £3,500				3,535	0	0			
Leopoldina Railway Company, Ltd., 5 % Terminable Debentures £2,000				2,000	0	0			
City of Moscow Loan 1912 4½ % Bonds £6,000				5,730	0	0			
Buenos Ayres Great Southern Railway Company 5 % Non-Cumulative Preference Stock £2,500				2,825	0	0			
New York Central and Hudson River Railroad Company 4 % 30 Year Gold Debentures £6,000				5,730	0	0			
Northern Pacific and Great Northern Railway 4 % Joint Bonds £5,000				5,050	0	0			
London County Consolidated 3½ % Stock £135 8s. 4d.				130	0	0			
							25,000	0	0
(*The approximate value of these Investments on the 29th July,* 1914, *was* £24,213 7s. 5d.)									
							£41,536	15	6

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st Dec., 1914.

ALFRED C. HARPER, *Auditor*
(Harper Brothers & Feather, *Chartered Accountants*),
16th January, 1915. 35 Great Tower Street, London, E.C.

Dr. **ALFRED DAVIS**

Bequeathed to the Society in 1870 for Annual Prizes,

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1913 . .	1,797 8 9	
,, Dividends received, 1914		49 14 5

WILLIAMS

Raised by Donations in 1891 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1913 . .	204 2 5	
	204 2 5	
,, Balance 31st December, 1913		8 0 5
,, Dividends received 1914		8 0 3
		16 0 8

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1913 . .	542 17 0	
	542 17 0	
,, Balance 31st December, 1913		12 1 5
,, Dividends received, 1914.		19 4 7
		£31 6 0

NICHOLSON

Raised by Donations in 1908 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund 31st December, 1913 . .	160 12 11	
,, Dividends received 1914		6 6 2

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£ s. d.	£ s. d.
To Amount of Fund 31st December, 1913 . .	557 14 6	
,, Balance 31st December, 1913		9 8 4
,, Dividends received, 1914		20 0 0
		29 8 4

TRUST FUND. Cr.

or in any other way the Council may determine.

		£ s. d.	£ s. d.
By Consols, £2,022 8s. 9d.	cost	1,797 8 9	
,, Revenue and Expenditure Account . . .			49 14 5

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£ s. d.	£ s. d.
By East India Railway Co. Annuity, Class B £7 .	168 0 0	
,, New South Wales Government 4 per cent. Inscribed Stock (1942–62) £36 3s. 1d. . . .	36 2 5	
	204 2 5	
,, Balance in hands of R. H. Society . . .		16 0 8
		16 0 8

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£ s. d.	£ s. d.
By Midland Railway Consolidated 2½ per cent. Perpetual Preference Stock £400 . . .	290 13 6	
,, Midland Railway Consolidated 2½ per cent. Perpetual Guaranteed Preferential Stock £400.	252 3 6	
	542 17 0	
,, Prof. Farmer for Lectures, 1914 . . .		20 0 0
,, Balance in hands of R. H. Society . . .		11 6 0
		£31 6 0

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£ s. d.	£ s. d.
By Tasmanian Government 4 per cent. Inscribed Stock (1940–50), £162 4s. 5d.	160 12 11	
,, Transfer to Wisley Prize Fund. . . .		6 6 2

PENSION.

Schröder to pay to Gardeners' Royal Benevolent Institution for one pension.

	£ s. d.	£ s. d.
By Great Western Railway 4 per cent. Debenture Stock £500	557 14 6	
,, Gardeners' Royal Benevolent Institution . .		20 0 0
,, Balance in hands of R. H. Society . . .		9 8 4
		29 8 4

	£ s. d.	£ s. d.
To Amount of Fund 31st December, 1913 . . .	5,604 16 7	
,, Contribution from R. H. Society, 31st December, 1914	382 8 3	
	5,987 4 10	
To Balance 31st December, 1913		13 18 5
,, Dividends and Donations received, 1914 . .		46 10 6
,, Contribution from R. H. Society, 31st December, 1914		47 11 9
		108 0 8

PRITZEL REVISION

Fund to be raised for the Revision of Pritzel's Iconum-

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1913 . .	500 0 0	
,, Contribution from R. H. Society, 1914 . .	250 0 0	
,, Transfer from Income Account . . .	109 2 2	
	859 2 2	
,, Balance, 31st December, 1913		109 2 2
,, Dividends received, 1914		22 13 10
		131 16 0

	£ s. d.	£ s. d.
By Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock £1,516 held by the Charity Commissioners	1,458 15 7	
" Value of Library, 31st December, 1913	4,146 1 0	
" Purchase of Books, 1914	382 8 3	
	5,987 4 10	
By Librarian's Salary		100 0 0
" Balance in hands of R. H. Society		8 0 8
		108 0 8

FUND.

Botanicarum Index. Estimated cost, £3,000.

	£ s. d.	£ s. d.
By India 2½ per cent. Stock, £1,367 13*s*. 6*d*.	859 2 2	
	859 2 2	
" Transfer to Capital Account		109 2 2
" Balance in hands of R. H. Society		22 13 10
		131 16 0

SCHEDULE OF INVESTMENTS.

31st December, 1914.

			£	s.	d.
2½ %	Consols £8,554 5s. 2d.	cost	8,162	16	0
3 %	Local Loans £5,800	,,	6,006	16	6
3½ %	Indian Rupee Paper 37,000 Rupees	,,	2,462	14	4
3½ %	Dominion of Canada Registered Stock (1930-1950) £2,000	,,	2,000	0	0
4 %	Canadian Pacific Railway Co. Perpetual Consolidated Debenture Stock £4,632	,,	4,999	14	1
3½ %	London County Consolidated Stock £2,864 11s. 8d.	,,	2,884	6	10
3½ %	India Stock £2,063 4s. 6d.	,,	2,024	10	4
4 %	Chicago, Milwaukee and St. Paul Railway Co. 25 years Gold Bonds of 1909 £2,000	,,	1,930	4	0
5 %	Havana Terminal Railroad Company Mortgage Debenture Bonds £8,300	,,	8,946	0	0
4½ %	Central Argentine Railway, Limited, Consolidated Preference Stock £2,800	,,	2,907	3	6
5 %	State of San Paulo Treasury Bonds (1913) £5,000	,,	4,897	13	0
4 %	Central Argentine Railway, Limited, Debenture Stock, £600	,,	537	15	10
2½ %	India Stock, £186 9s. 9d.	,,	109	2	2
4 %	Mortgage on Freehold £1,000	,,	1,000	0	0
			£48,868	16	7

GENERAL MEETING.

FEBRUARY 16, 1915.

Mr. JOSEPH CHEAL, V.M.H., in the Chair.

Fellows elected (21).—E. Frankland Armstrong, M.D., L. E. Bailey, Miss M. Cresswell, W. K. Darley, Major C. W. Gordon-Steward, A. Harden, R. Kerr, P. Lawrence, W. B. Liddiard, Lady Milbanke, E. Morgan, H. Morse, Miss G. C. Mortimer, J. E. Phillips, W. P. Pinder, Mrs. J. J. Reading, Sir Henry Ripley, Bt., J. T. Sydenham, R. C. M. Symms, Miss A. C. Taylor, Mrs. F. Worts.

Fellows resident abroad (2).—F. R. Wiggett Dyde (Michigan, U.S.A.), J. F. Piper (New Jersey, U.S.A.).

Associates (11).—Miss L. Bradshaw, George Clarke, Miss C. Fleming, Miss S. Forssman, Miss D. Hosegood, Miss L. Hurst, Miss J. B. M. Johnson, Miss E. Maclaine, Miss E. Tufnell, Miss P. R. Webb, Miss E. Williams.

A lecture on "Trees of the Cambridge Botanic Garden" was given by Mr. R. Irwin Lynch, M.A., V.M.H. (see p. 1).

GENERAL MEETING.

MARCH 2, 1915.

Dr. FREDERICK KEEBLE, F.R.S., in the Chair.

Fellows elected (45).—Mrs. E. H. Baldock, Miss K. Bartram, Mrs. Leycester Barwell, Mrs. J. Burnett-Stuart, Mrs. M. A. Chaldecott, Mrs. C. F. Clive, Mrs. H. W. Davis, Mrs. R. P. Dipple, Mrs. F. E. Emerson, Mrs. J. Frankland, S. K. George, E. R. Gibbs, Miss J. Greet, The Countess Grosvenor, N. H. Grubb, Hon. Mrs. Henry Guest, Mrs. Hall, Mrs. H. Headlam, Alfred Holt, M.A., D.Sc., Mrs. Harrison Holt, W. Honess, Mrs. Inman, C. W. Kemp, H. E. Kemp, J. B. Lawford, M.D., F.R.C.S., Miss M. D. MacEwan, Lady MacGregor, Miss Mair, Lady Katherine Meade, R. Morse, Mrs. W. Nicholson, Mrs. E. Nugent, W. W. Parish, R. C. Parr, J.P., D.L., Mrs. Posnett, Mrs. Randle, The Hon. Charles Russell, Mrs. Schwabe, W. Crichton Stagg, W. Stirling, Miss O. Sturdy, H. Thomlinson, Miss E. O. Toulmin, Mrs. H. A. Trotter, Mrs. H. Van den Bergh.

Fellows resident abroad (3).—E. Devonshire (Canada), W. Evans Jackson (Canada), Edmund Mann (Queensland).

Associates (3).—T. Bowser, Miss H. M. Gregson, Miss A. M. Thomson.

Societies affiliated (3).—St. James's Horticultural Society, Henley-on-Thames Horticultural Society, Newport (Rhode Island) Garden Club.

Lectures were given by Colonel R. H. Rawson, C.B., on "Colour Changes in Flowers by the Removal of Sunlight" (see p. 42); and by Dr. Claud F. Fothergill on "Pressing Flowers to Retain their Colours" (see p. 40).

GENERAL MEETING.

MARCH 9, 1915.

Dr. FREDERICK KEEBLE, F.R.S., in the Chair.

Fellows elected (11).—Mrs. J. A. Collins, Miss E. Heathcote, J. H. Hull, L. J. L'Estrange, Mrs. Nalder, Miss D. E. B. Norman, C. E. M. Russell, Maj.-Gen. E. H. Sartorius, Mrs. Courtney Tarbutt, Mrs. M. A. Towell, Thomas C. Williams.

Fellow resident abroad (1).—Herbert A. Casson, C.S.I. (India).

A lecture on "Flowers from Seed, in the Greenhouse and in the Open Border" was given by Mr. Leonard G. Sutton.

SPRING SHOW OF FORCED BULBS.

TUESDAY AND WEDNESDAY, MARCH 9 AND 10, 1915.

HYACINTHS, TULIPS, AND DAFFODILS.

The Council offered (subject to the General Rules of the Society) the following Prizes presented to them by the General Bulb Growers' Society of Haarlem:—

Division I.—For Amateurs.

Class 2.—Eighteen Hyacinths, distinct.

First Prize, Gold Medal and £3 3*s.*; Second, Silver-Gilt Medal and £2 2*s.*; Third, Silver Medal and £1 1*s.*

1. The Duke of Portland, K.G., Welbeck, Worksop (gr. Mr. J. Gibson).
   R. G. Morrison, Esq., The Hollies, Victoria Park, Wavertree (gr. Mr. H. Raper).
3. The Marquis of Ripon, Coombe Court, Kingston Hill (gr. Mr. T. Smith).

Class 3.—Twelve Hyacinths, distinct.

First Prize, Silver-Gilt Medal and £2 2*s.*; Second, Silver Medal and £1 1*s.*; Third, Bronze Medal and 10*s.*

1. S. Noblett, Esq., Derby House, Fairfield, Liverpool (gr. Mr. W. Bushell).
2. Miss C. A. Michell, Oakfield, Cricklewood.
3. Lady Tate, Park Hill, Streatham Common (gr. Mr. W. Howe).

Class 4.—Six Hyacinths, distinct.

First Prize, Silver Medal and £1 1*s.*; Second, Bronze Medal and 10*s.*

1. L. Thomson, Esq., Ailsa Craig, Formby, Liverpool.
2. Mrs. McDowell Nathan, Little Heath Wood, Potters Bar (gr. Mr. W. H. Newton).
3. H. S. Bartleet, Esq., Severndroog, Shooters Hill.
   G. Goodsir, Esq., Wallacefield, Coombe Lane, Croydon (gr. Mr. W. Coles).

Class 5.—Eight Pans, containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other seven pans. The bulbs need not have been actually grown in the pans.

First Prize, Gold Medal and £3 3*s.*; Second, Silver-Gilt Medal and £2 2*s.*; Third, Silver Medal and £1 1*s.*

1. The Duke of Portland, K.G.

Class 6.—Four pans, containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other three pans. The bulbs need not have been actually grown in the pans.

First Prize, Silver-Gilt Medal and £2 2*s.*; Second, Silver Medal and £1 1*s.*; Third, Bronze Medal and 10*s.*

No Award.

Class 7.—The finest decorative display of Hyacinths, to be staged on the floor.

First Prize, Gold Medal and £3 3*s.*; Second, Silver-gilt Medal and £2 2*s.*; Third, Silver Medal and £1 1*s.*

1. The Duke of Portland, K.G.
2. The Misses Tate and Tanner, Caldecote Towers, Bushey Heath (gr. Mr. F. Streeter).

Division II.—For Trade Growers.

Class 8.—The finest decorative display of Hyacinths, to be staged on the floor.

Special Prize—Silver Cup of the General Bulb Growers' Society of Haarlem, Holland.

First Prize, Gold Medal; Second, Silver-gilt Medal; Third, Silver Medal.

1. Messrs. Cuthbert, Southgate Nursery, N.

BULBS GROWN IN MOSS FIBRE &C.

Subject to the General Rules of the Society the Council also offer the following Prizes presented to them by Messrs. Robert Sydenham :—

Classes 9–11.—Bulbs grown in moss fibre or similar material (not earth) and without drainage.

The exhibits in these classes must have been grown entirely in the receptacles in which they are shown.

Amateurs.

Class 9.—Six single Hyacinths, in separate vases, not exceeding six inches in diameter, to be selected from any one of the following varieties: 'Balfour,' 'Boerhave,' 'City of Haarlem,' 'Enchantress,' 'General Vetter,' 'Innocence,' 'Ivanhoe,' 'Jacques,' 'King of the Blues,' 'Koh-i-Noor,' 'La Victoire,' 'Lady Derby,' 'La Grandesse,' 'Queen Mary,' 'Schotel,' 'Totula.'

First Prize, £1 1*s.*; Second, 17*s.* 6*d.*; Third, 15*s.*; Fourth, 10*s.* 6*d.*; Fifth, 7*s.* 6*d.*

1. Lady Tate.

Class 10.—Six vases of Tulips (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Couleur Cardinal,' 'Fabiola,' 'Golden Queen,' 'Joost van Vondel,' 'Keizerskroon,' 'Le Rêve,' 'Pink Beauty,' 'Prince of Austria,' 'Red Admiral,' 'Rose Luisante,' 'Van der Neer,' 'Vermilion Brilliant,' and 'White Joost van Vondel.'

First Prize, £1 1s.; Second, 17s. 6d.; Third, 15s.; Fourth, 10s. 6d.; Fifth, 7s. 6d.

1. Lady Tate.

Class 11.—Six vases of Narcissi (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Albatross,' 'Argent,' 'Artemis,' 'Bianca,' 'Cardinal,' 'Dairymaid,' 'Diadem,' 'Duchess of Westminster,' 'Firebrand,' 'Glitter,' 'Gloria Mundi,' 'Golden Bell,' 'Horace,' 'Lilian,' 'Lucifer,' 'Madame de Graaff,' 'Oriflamme,' 'Scarlet Runner,' 'Seagull,' 'Siddington,' 'Stonechat,' 'Valeria,' 'Victoria,' and 'White Lady.'

First Prize, £1 1s.; Second, 17s. 6d.; Third, 15s.; Fourth, 10s. 6d.; Fifth, 7s. 6d.

1. Lady Tate.

GENERAL MEETING.

MARCH 16, 1915.

Dr. FREDERICK KEEBLE, F.R.S., in the Chair.

Fellows elected (22).—Mrs. F. Bennett, Dr. P. H. Bindley, G. Burrell, Guy Calthorp, Rev. H. Daman, Mrs. J. L. Fremlin, Miss D. Giffard, Miss C. Gittins, M. Ilott, Mrs. A. Johnson, Thomas Jones, N. F. Kingzett, Mrs. Hope Macdonald, N. Priest, Mrs. H. K. Prosser, Miss Ricardo, W. Robertson, Sir John Sankey, Mrs. R. Swetenham, Mrs. A. Varley, R. T. Went, T. H. Wiles.

Fellows resident abroad (2).—Mrs. Frank Leather (Vancouver, B.C.), H. Raj. Sud (Benares, India).

Associate (1).—Miss S. T. Stewart.

A lecture on "The Passing of Darwinism" was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (see p. 47).

GENERAL MEETING.

MARCH 30, 1915.

Mr. E. A. BOWLES, F.L.S., in the Chair.

Fellows elected (44).—Miss E. Arnold, F. Botterill, Miss Corfield, T. Craven, H. Creer, C. A. Dunn, Mrs. B. Dyer, Miss S. M. Fry, Mrs. Gay, E. J. Gladwin, G. Hamilton-Smith, Mrs. Harbord, Mrs. Horne, Miss E. James, Mrs. R. James, J. R. Joy, Mrs. Linnell, Miss Lusher, Miss A. L. Major, Mrs. R. D. Muir, Mrs. W. Mundey, J. Murray, Mrs.

Neville, W. I. Newport, Miss E. F. Parkinson, Dr. W. Pasteur, W. S. Patterson, Miss M. E. Pleydell-Bouverie, Lady Ramsden, Lady Robertson, The Raja Muda of Sarawak, Mrs. Hudson Scott, Miss J. M. B. Shirreff, Mrs. A. Bowes-Smith, Mrs. R. L. Smith, Rt. Hon. C. B. Stuart-Wortley, M.P., Miss B. H. Tebb, A. Thomson, Mrs. Walker, A. Waterfall, C. A. Whatmore, B.A., B.Sc., Brig.-Gen. H. S. Neville White, Mrs. A. Whitehead, T. Wilson.

Associates (4).—A. Davis, T. Lynas, Miss E. S. Price, Miss M. W. Walker.

Society affiliated (1).—King Edward Building (G.P.O.) Horticultural Society.

A lecture on "Chrysanthemums in Pots" was given by Mr. Thomas Stevenson (see p. 64).

GENERAL MEETING.

April 13, 1915.

Mr. Joseph Cheal, V.M.H., in the Chair.

Fellows elected (32).—Mrs. R. H. Carr-Ellison, Mrs. G. E. Clarke, C. W. Cole, Mrs. M. Courtney, Mrs. L. Cust, J. H. Farrant, A. C. Feaver, R. J. L. Fytche, R. Hall, Mrs. G. E. Haslip, Mrs. Hayes, W. Honeywill, D. M. Horne, Dr. John, G. Maitland King, Rev. H. H. Lowe, Mrs. L. H. Marriott, Miss R. Mathias, A. H. Maude, J.P., F.L.S., F. de C. Montfort, Mrs. M. E. Muir, R. Murrell, G. V. Parker, P. S. Patrick, T. R. Ronald, G. C. Sellar, N. St. B. Sladen, Miss C. C. Thornhill, Rev. F. Varley, Mrs. J. Venning, Mrs. Woolsey, H. Wright.

Fellows resident abroad (1).—J. H. Goodden (Colorado).

Associates (4).—Miss E. Adair, H. A. Bird, J. Kelly, E. G. Woodman.

A lecture on "Trees and Shrubs of the Pacific Coast" was given by Mr. F. R. S. Balfour, M.A. (see p. 21).

DAFFODIL SHOW.

Tuesday and Wednesday, April 13 and 14, 1915.

Section I.

Open Classes.

(Exhibitors in Section I. may not enter or compete in Sections II. or III.)

Class 1.—Collection of Daffodils, 48 varieties, fairly representing the different Divisions. Three stems of each.

First Prize, Silver-Gilt Cup and £1; Second, Standard Cup and £1; Third, Silver-Gilt Flora Medal and £1.

1. A. M. Wilson, Esq., Shovell, North Petherton.
2. Not awarded.
3. W. A. Watts, Esq., Bryn, St. Asaph.

Class 2.—Twelve varieties. (Division I.) Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. A. M. Wilson, Esq.
2. F. H. Chapman, Esq., Guldeford Lodge, Rye, Sussex.
3. W. A. Watts.

Class 3.—Twelve varieties. (Division II.) Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. A. M. Wilson, Esq.

No second.

3. W. A. Watts.

Class 4.—Twelve varieties. (Division III.) Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. A. M. Wilson, Esq.

Class 5.—Nine varieties. (Division IV.) Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. A. M. Wilson, Esq.
2. W. A. Watts, Esq.

Class 6.—Nine varieties, selected from Divisions V., VI., and VII. Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, 15s.; Third, 10s.

1. A. M. Wilson, Esq.

Class 7.—Six varieties. (Division VIII.) Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, 15s.; Third, 10s.

1. A. M. Wilson, Esq.

Class 8.—Nine varieties. (Division IX.) Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, 15s.; Third, 10s.

No entry.

Class 9.—Six varieties. (Division X.) Three stems of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, 15s.; Third, 10s.

3. W. A. Watts, Esq.

Section II.

Amateurs only.

All flowers in this Section must be in commerce.
(Exhibitors in Section II. may not enter or compete in Sections I. or III.)

Class 10.—Collection of Daffodils, 24 varieties, fairly representing the different Divisions. Three stems of each.
First Prize, Standard Cup and £1; Second, Silver-gilt Banksian Medal and 15s.; Third, Silver Flora Medal and 10s.

1. Mrs. E. Gage-Hodge, Huxham Rectory, Exeter.
2. Rev. T. Buncombe, The Rectory, Black Torrington, Devon.

Class 11.—Six varieties. (Division I.) Three stems of each.
First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. Mrs. E. Gage-Hodge.
2. R. Morton, Esq., Grange Dene, Woodside Park, N.
3. Rev. T. Buncombe.

Class 12.—Six varieties. (Division II.) Three stems of each.
First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. Mrs. E. Gage-Hodge.
2. R. Morton, Esq.
3. Rev. T. Buncombe.

Class 13.—Six varieties. (Division III.) Three stems of each.
First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. Rev. T. Buncombe.

Class 14.—Six varieties. (Division IV.) Three stems of each.
First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. R. Morton, Esq.
2. Rev. T. Buncombe.

Class 15.—Six varieties. (Division IX.) Three stems of each.
First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

No entry.

Class 16.—Six varieties. (Division V.) One stem of each.
First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

No entry.

Class 17.—Six varieties. (Division VIII.) Three stems of each.
First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. Rev. T. Buncombe.

Class 18.—Three varieties. (Division X.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. R. Morton, Esq.
2. Rev. T. Buncombe.

Section III.

Amateurs only.

All flowers in this Section must be in commerce.
(Exhibitors in Section III. may not enter or compete in Sections I. or II.)

Class 19.—Twelve varieties, fairly representing the different Divisions. Three stems of each.
First Prize, Silver-gilt Banksian Medal and 10*s.* 6*d.*; Second, Silver Flora Medal and 7*s.* 6*d.*; Third, Silver Banksian Medal and 5*s.*

1. Major G. Churcher, Woodcote, The Avenue, Alverstoke.
2. Rev. Canon W. Fowler, Earley Vicarage, Reading.
3. Miss V. Warren, The Oaks, Westbere, Canterbury.

Class 20.—Three varieties. (Division Ia.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Major G. Churcher.
2. Rev. Canon W. Fowler.
3. G. Stocks, Esq., 44 Bentley Road, Doncaster.

Class 21.—Three varieties. (Division Ib.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Miss V. Warren.
2. Rev. Canon W. Fowler.
3. Major G. Churcher.

Class 22.—Three varieties. (Division Ic.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Major G. Churcher.
2. Rev. Canon W. Fowler.
3. G. Stocks, Esq.

Class 23.—Three varieties. (Division IIa.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Miss V. Warren.
2. Major G. Churcher.
3. G. Stocks, Esq.

Class 24.—Three varieties. (Division IIb.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Rev. Canon W. Fowler.
2. Major G. Churcher.
3. Miss V. Warren.

Class 25.—Three varieties. (Division IIIa.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

No entry.

Class 26.—Three varieties. (Division IIIb.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Miss V. Warren.
2. G. Stocks, Esq.

Class 27.—Three varieties. (Division IV.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Major G. Churcher.
2. Miss V. Warren.
3. G. Stocks, Esq.

Class 28.—Three varieties. (Division V.) One stem of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

No entry.

Class 29.—Three varieties. (Division VIII.) Three stems of each.
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. Major G. Churcher.
2. G. Stocks, Esq.

Class 30.—Three varieties. (Division IX.) Three stems of each.
First Prize, 7s. 6d.; Second, 5s.; Third, 3s.

1. Major G. Churcher.
2. G. Stocks, Esq.

Class 31.—Three varieties. (Division X.) Three stems of each.
First Prize, 7s. 6d.; Second, 5s.; Third, 3s.

1. Rev. Canon W. Fowler.
2. Miss V. Warren.

SECTION IV.

Seedling and New Daffodils—Open Classes.

Class 32.—Twelve varieties, introduced into commerce since 1911. One stem of each.
First Prize, Standard Cup and £1; Second, Silver-gilt Flora Medal and 15s.; Third, Silver-gilt Banksian Medal and 10s.

No entry.

(Exhibitors were not permitted to enter or compete in more than one of the Classes 33, 34, and 35.)

Class 33.—Twelve varieties, not in commerce. One stem of each.
First Prize, Engleheart Cup and £1; Second, Silver-gilt Flora Medal and £1; Third, Silver-gilt Banksian Medal and 15s.

1. Messrs. Barr & Sons, King Street, Covent Garden.
2. A. M. Wilson, Esq.
3. M. F. H. Sutton, Esq., Erlegh Park, Reading (gr. Mr. H. C. Loader).

Class 34.—Six varieties, not in commerce. One stem of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, Silver Flora Medal and 15s.; Third, Silver Banksian Medal and 10s.

1. Miss V. Warren.
2. F. H. Chapman, Esq.
3. W. F. M. Copeland, Esq., West View, Shirley, Southampton.

Class 35.—Three varieties, not in commerce. One stem of each.
First Prize, Silver Flora Medal and 10s.; Second, Silver Banksian Medal and 7s. 6d.; Third, 7s. 6d.

1. C. Lemesle Adams, Esq., Pendeford Hall, Wolverhampton.
2. Mrs. E. Gage-Hodge.
3. Rev. T. Buncombe.

(Exhibitors were not permitted to enter or compete in more than one of the Classes 36 and 36A, both of which were judged for their decorative effect.)

Class 36.—Three varieties, not in commerce. Nine blooms of each.
First Prize, Silver-gilt Banksian Medal and £1; Second, Silver Flora Medal and 15s.; Third, Silver Banksian Medal and 10s.

1. P. D. Williams, Esq., Lanarth, St. Keverne, Cornwall.
2. F. H. Chapman, Esq.
3. A. M. Wilson, Esq.

Class 36A.—One variety, not in commerce. Nine blooms.
First Prize, Silver Flora Medal and 7*s*. 6*d*.; Second, Silver Banksian Medal and 5*s*.; Third, Bronze Flora Medal and 2*s*. 6*d*.
No entry.

Class 37.—Nine varieties of Triandrus Hybrids, not in commerce. One stem of each.
First Prize, Silver-gilt Flora Medal and £1; Second, Silver-gilt Banksian Medal and 15*s*.; Third, Silver Flora Medal and 10*s*.
1. F. H. Chapman, Esq.

(Exhibitors were not permitted to enter or compete in more than one of the Classes 38, 39, and 40.)

Class 38.—Twelve varieties, raised by the exhibitor. One stem of each.
First Prize, Silver-gilt Cup; Second, Standard Cup; Third, Silver-gilt Flora Medal.
1. P. D. Williams, Esq.
2. Messrs. Barr.

Class 39.—Six varieties, raised by the Exhibitor. One stem of each.
First Prize, Standard Cup; Second, Silver-gilt Flora Medal; Third, Silver-gilt Banksian Medal.
1. F. H. Chapman, Esq.
2. {A. M. Wilson, Esq.
   {T. Batson, Esq., Beaworthy, Devon.

Class 40.—Three varieties, raised by the Exhibitor. One stem of each.
First Prize, Silver-gilt Flora Medal; Second, Silver Flora Medal; Third, Silver Banksian Medal.
1. Rev. T. Buncombe.
2. C. Lemesle Adams, Esq.
3. G. Stocks, Esq.

Section V.

Single Blooms—Open Classes.

Class 41.—One bloom. (Division Ia.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. A. M. Wilson, Esq.
2. Rev. T. Buncombe.
3. W. A. Watts, Esq.

Class 42.—One bloom. (Division Ib.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. T. Batson, Esq.

Class 43.—One bloom. (Division Ic.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. T. Batson, Esq.
2. P. D. Williams, Esq.
3. Rev. T. Buncombe.

Class 44.—One bloom. (Division IIa.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
Equal 1. { P. D. Williams, Esq.
A. M. Wilson, Esq.
2. F. H. Chapman, Esq.
3. W. F. M. Copeland, Esq.

Class 45.—One bloom. (Division IIb.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. P. D. Williams, Esq.
2. F. H. Chapman, Esq.
3. A. M. Wilson, Esq.

Class 46.—One bloom. (Division IIIa.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. F. H. Chapman, Esq.

Class 47.—One bloom. (Division IIIb.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. A. M. Wilson, Esq.
2. P. D. Williams, Esq.
3. W. A. Watts, Esq.

Class 48.—One bloom. (Division IV.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. W. F. M. Copeland, Esq.

Class 49.—One stem. (Division V.) Trumpet shaped.
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. F. H. Chapman, Esq.
2. P. J. Worsley, Esq., Rodney Lodge, Clifton, Bristol.

Class 50.—One stem. (Division V.) Cup shaped.
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. P. D. Williams, Esq.
2. W. F. M. Copeland, Esq.
3. F. H. Chapman, Esq.

Class 51.—One stem. (Division VII.)
First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 2*s*. 6*d*.
1. P. D. Williams, Esq.
2. W. F. M. Copeland, Esq.
3. A. M. Wilson, Esq.

Class 52.—One stem. (Division VIII.)
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 2*s.* 6*d.*
1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.

Class 53.—One bloom. (Division IX.)
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 2*s.* 6*d.*
1. A. M. Wilson, Esq.
2. P. D. Williams, Esq.
3. F. H. Chapman, Esq.

Class 54.—One bloom. (Division X.)
First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 2*s.* 6*d.*
1. A. M. Wilson, Esq.
2. W. F. M. Copeland, Esq.
3. W. A. Watts, Esq.

Section VI.

Open to all Amateurs.

Irrespective of whether they are, or are not, competing in any of the previous sections.

Class 55.—A Collection of thirty-six varieties, three stems of each, fairly representing Divisions I., II., III., IV., V., IX., and X. Divisions VI. and VII. optional, Divisions VIII. and XI. excluded.

The Council have accepted the prizes offered in this class by Messrs. Barr & Sons, for award at the Daffodil Show.

First Prize, the Barr Silver Daffodil Vase; Second, £3; Third, £2.
No entry.

Barr Memorial Cup.

P. D. Williams, Esq.

GENERAL MEETING.

April 27, 1915.

Mr. R. C. Notcutt in the Chair.

Fellows elected (46).—Rev. H. S. Acworth, Mrs. Allcroft, Mrs. A. Allgood, Mrs. John Andrews, J. Armitage, Mrs. W. Ashley, Miss P. M. Blackwell, Mrs. R. Blundell, Mrs. H. P. Bond, Miss A. Broughton, A. B. Bruce, J. J. Burton, D. G. Cameron-Rose, Miss V. Conway, Mme. A. Corti, Miss Dunphy, Mrs. Echaloz, F. Eckstein, Miss A. F. FitzGerald, Miss M. Foster, Mrs. Middleton Goldie, R. P. Goldney, T. A. Greenfield, W. L. Griffith, Miss F. C. Grundy, The Viscountess Hardinge, Mrs. Hennell, F. W. Hunt, F.R.I.B.A., P. Kestner, S. G. Koppenhagen, J. Laurance, Lady Mabel Gore Langton, R. Longley, M. Michaelson, Mrs. H. Noel, R. H. Philipson, Mrs. A. J. F. Platt, Miss E. Ashmore Powell, A. D. Raine, Mrs. Shrapnell-Smith, Miss D.

Stedall, Rev. H. R. Sugden, G. Underwood, J. S. Wilkins, P. H. Wright, Mrs. W. W. Wynne.

Associate (1).—F. Start.

Society affiliated (1).—Pietermaritzburg Horticultural Society.

A lecture on "Darwin's Alternative Explanation of Evolution by Self-Adaptation" was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (see p. 54).

SCIENTIFIC COMMITTEE.

JANUARY 5, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with ten members present and Messrs. Langley Smith and Davis.

Variegation in Pelargoniums.—Mr. A. Langley Smith showed a series of scented-leaved Pelargoniums with the following note of variegation in them :—

"1. Variegation is a heritable character in scented-leaved Pelargoniums.

"2. It appears to behave as a recessive character.

"3. It is probably due to the *absence* of a factor in whose presence the leaf is green.

"4. This absence is sometimes due to the rearrangement of unit characters under the influence of hybridization of species.

"5. The variegation may be (i.) albinism, or (ii.) dark purplish-brown stripes along the chief veins."

Examples exhibited :—

(1) *P. denticulatum* × *P. filicifolium* (seedlings F_2 generation) (F_1 showed slight variegation similar to set B).

	Variegated.	Not variegated.	Total.
Set A . . .	3	9	12
Set B . . .	5	19	24
Set C . . .	2	5	7
Totals . . .	10	33	43

(2) Hybrids of *P. citriodorum minor*, F_2 generation (in which variegation first appeared).

	3 (2 barren)	4	7

F_3 generation (from variegated hybrid above).

Set D . . .	3	8	11

(3) Hybrids of *P. cordatum*, F_1 generation.

Set E . . .	1	3	4

(4) Hybrids of *P.* 'Cataract' (= *P. Radula* × *P. denticulatum*) × *P. denticulatum.*

	Dark Centre.	Plain.	
Set F . . .	4	5	9

"Note also dark stripes in leaves of hybrid Pelargoniums 'Patience' and 'Felicity' (*P. tomentosum* × *P. filicifolium*) and *P. tomentosum Smithii* (*P. tomentosum* × *P. denticulatum*)."

The variegation was as a rule but poorly marked, and in many took the form of a very narrow, whitish line round the margin of the leaf.

Colour in seeds of Amaryllis.—Mr. A. Worsley showed some seeds of *Amaryllis* × *Parkeri*, some of which were reddish tinged, some without the red tint. He remarked that he had seen no true albino of *Amaryllis Belladonna*, but *A.*×*Parkeri* gave about 60 per cent. albino seeds on two occasions on which they were gathered. These seeds gave white-flowered plants.

Effect of light &c. on Orchids.—Mr. Gurney Fowler sent a number of young Orchid plants to draw attention to the short, stout, and sturdy new pseudo-bulbs formed since the plants were removed to their new quarters at Pembury, Kent, and away from the smoke area in which they were grown heretofore. Sir Everard im Thurn said the appearance of the plants reminded him of that shown by *Cattleya superba* when growing wild on the outer branches of trees where much light gained access to it.

Mr. Fowler also sent a plant bearing flowers on both an old and a new growth; the flowers on the former opened about three days before those on the latter.

Albino seeds of Crinum Moorei.—Mr. Worsley said he had grown albino seeds of *Crinum Moorei* received from Australia last spring and had found the bulb formed to have reached a larger size than the seed, although he had been unable to detect the presence of any chlorophyll in the plants. The increased size was probably due to an increased amount of water. Mr. Chittenden said that the seed he took germinated, and the plant, which was a perfect albino, had now its second set of shoots, which were rather more weakly than the first.

Conifer growing under Spray of Waterfall.—Sir Everard im Thurn showed a specimen and photograph taken in the Blue Mountains, Australia, of the Conifer *Pherosphaera Fitzgeraldii* growing in the spray of a waterfall, a remarkable situation for a plant of this family, but apparently normal for this species.

Acrotriche fasciculiflora.—Dr. A. B. Rendle, F.R.S., showed a dried specimen of a remarkable Epacrid, *Acrotriche fasciculiflora* Benth., which he had collected at the top of Mount Lofty, in South Australia. It produces an enormous number of flowers in a great fascicle on the old wood just above the base of the stem, forming a covering 3 or 4 inches through.

Myrtle fruiting.—Mr. C. D. Langworthy sent a shoot of the common Myrtle picked from the open and bearing a large number of ripe fruits.

SCIENTIFIC COMMITTEE, JANUARY 19, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Albino Crinum Moorei.—Mr. F. J. Chittenden, F.L.S., showed the albino plant raised from the albino seed exhibited last April and mentioned at the last meeting. (It has since died, apparently of starvation from lack of chlorophyll.)

Prunus, wild.—Mr. J. Fraser, F.L.S., exhibited dried fruiting specimens of a *Prunus* which had small oval purple fruits, collected at the top of Box Hill. He had not seen the plant in flower, but from the form of the fruit, the shape of the foliage, and the shape of the stone, he thought it probably a hybrid between the wild Sloe and one of the cultivated Plums.

Sequoia gigantea diseased.—Mr. A. Worsley said that trees of *Sequoia gigantea* round Isleworth frequently died when they had attained a height of 40 to 50 feet. One had recently died in his garden, and on cutting up the part of the bole near the root he had found stains of a greyish-purple colour evidently produced by the growth of a fungus.

Cypripedium niveum × *C. insigne Sanderae* (= *C.* × *Boltonii*).—Mr. R. A. Rolfe, A.L.S., exhibited a flower of a *Cypripedium* from Mr. W. Bolton, of Wilderspool, from one of several plants raised from *C.* × *Boltonii*, stated to be crossed with another form. All alike had albino flowers, with a few minute brown spots on the standard. *C.* × *Boltonii* itself provides a good example of a dominant white.

Odontoglossum × *Horsmanii.*—Mr. Rolfe also exhibited a flower of an *Odontoglossum* that flowered among some imported *O. Pescatorei* with Mr. W. Bazeley, Twyford, Berks. He referred it to *O.* × *Horsmanii*, Reichb., originally described as a natural hybrid between *O. Pescatorei* and *O. luteo-purpureum*, but suggested that *O. sceptrum* (not *luteo-purpureum*) was the second parent, as it has the rounder shape and broader segments of the latter, as was also the case with the earlier form. The flower was cream-white, with a group of red-purple spots on each segment, while the lip was yellow, with a red blotch in front of the *sceptrum*-like crest.

Oak with curious Foliage.—Mr. Bowles said he had received a communication from Dr. Henry, who recognized the Oak, from which the curiously-shaped leaves shown by him some time ago were derived, as *Quercus pedunculata* var. *scolopendrifolia*, a variety the origin of which is not known. The tree from which the specimens were gathered occupies a position in an old pasture, and is unlikely to have been grafted. See JOURNAL R.H.S. 40, p. clxxxi.

January-flowering Plants.—Mr. Bowles also exhibited flowering specimens of *Correa magnifica* from a shrub on a south wall, *Sycopsis sinensis* from one in the open, and *Euphorbia biglandulosa*, as examples of plants flowering normally in his garden in January.

SCIENTIFIC COMMITTEE, FEBRUARY 2, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with seventeen members present and others.

Primula malacoides &c.—Mr. A. Worsley showed an inflorescence of *P. malacoides* (now bearing seed) in which the perianth was extremely small. Since its introduction *P. malacoides* has produced a consider-

able number of varieties, and provides an interesting example of variation in a weed of cultivated land having apparently a rather restricted range. He also showed a fruit of a small Pineapple from Pernambuco, which grew and fruited in a cool greenhouse at Isleworth.

Vegetative Buds in Inflorescence of Tacca cristata.—Mr. W. Hales, A.L.S., showed inflorescences of *Tacca cristata* in each of which a bud had produced a rosette of leaves with a small tuber at the base, very similar to that of the Hedychium shown by Mr. Elwes on December 15, 1914. See JOURNAL R.H.S. 40, p. clxxxiii.

The Chemistry of Flower Colours.—Dr. F. Keeble, F.R.S., gave an account, illustrated by experiments, of the present state of our knowledge of the chemical nature of flower pigments. It was demonstrated that an extremely close relation exists between the anthocyan pigments of the flower and oxydases. Such a parallelism lends support to the view that the anthocyan pigments are due to the action of oxydases on chromogens. It was shown, however, that anthocyan-like substances have been produced by various experimenters, not by the oxidation, but by the reduction of substances which occur in plants. To reconcile these two divergent phenomena Dr. Keeble pointed out that the action of an oxydase may involve not only the oxidation of a given substance, but the simultaneous reduction of another. At the conclusion of the lecture specimens of the anthocyan pigments as prepared by Willstätter and Everest were exhibited.

SCIENTIFIC COMMITTEE, FEBRUARY 16, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Variation in Orchid Seedlings.—Mr. G. Wilson, F.L.S., showed on behalf of Messrs. Charlesworth & Co. a number of flowers of *Odontioda* × 'Brunette' to illustrate the remarkable range of variation shown by the seedlings from one seed-pod. The following represents the chief variations in colour, but variation was also to be seen in the form and size of lips and segments: (1) Dark, bright purple, with pale markings on lip just within the margin; segments dark, bright purple. (2) Dull purple, with more pale markings in same place; segments dull purple. (3) Still deeper purple, with same markings; segments deep purple. (4) Lip reddish-purple with pale markings within margin; segments purple, yellow-tipped, with few narrow yellow lines. (5) Lip with red-brown spotting on disc, sprinkled with same on lower half, and purple-tinted along margin; segments similar to last, but yellow streaks more abundant and no yellow tip. (6) Like (1), but with white streaks and white margins to segments. (7) Lip heavily spotted with reddish-brown purple at tip; segments red-brown with yellow lines; inner yellow-margined. (8) Lip spotted purple, lower half white; segments yellow-tipped, but ground cream with heavy purple blotches. (9) Red-brown, and

with yellow markings on all segments; no purple. (10) Yellow with red-brown blotches except in lower half of lip. *Odontioda* × 'Brunette' is the result of crossing *Odontioda* × *Bohnhoffiae* (*Odontoglossum cirrhosum* × *Cochlioda vulcanica*) with *Odontoglossum Harryanum*.

Mr. R. A. Rolfe, A.L.S., showed a series of flowers of *Cymbidium* × 'Butterfly' (*Lowio-grandiflorum* × *insigne*) from the collection of Lieut.-Colonel Sir George L. Holford, Westonbirt, Tetbury. The flowers were from the same seed-pod and comprised eight forms—one cream, one light yellow, and six various shades of rose-pink in the segments, while the lips showed much variation in the amount of spotting.

Gooseberry diseased.—Mr. E. M. Holmes, F.L.S., showed a shoot of Gooseberry with the black pycnidia of a species of *Coniothyrium* upon it, which he believed to be *C. ribicolum*, a species found upon Currants.

Leucojum Vagneri.—Mr. W. H. B. Fletcher, of Aldwick Manor, Bognor, sent a number of flowers of this fine form of Snowflake, which is rarely seen or mentioned. Most of the scapes bore five or six flowers and many of the flowers were more or less abnormal in some degree, perhaps due to the vigour of the plants, which had been in his garden for about fourteen or fifteen years. (Fig. 51).

New Fungus in Scale Insects.—Dr. A. S. Horne showed specimens, with respect to which he made the following communication: "In December 1914, Professor Lefroy brought to my notice some Centropogons heavily infested with the greenhouse white fly, *Aleyrodes vaporariorum*. The leaves were covered on their under surface with tufts of fungus mycelium. One of the fungi present proved to be a species of *Cladosporium*, which acts by investing the almost permanently-attached scale and apparently closes the tracheæ; another is a species of the genus *Cephalosporium*, which resembles in mode of occurrence but is specifically distinct from the entomogenous *Cephalosporium Lecanii*, discovered by Zimmermann in Java (1898), afterwards found in the West Indies by H. M. Lefroy (1902), and subsequently used to combat the Brown Shield Scale (*Saissetia hemisphaerica*) and other West Indian pests. This *Cephalosporium* appears to differ in important characters from those already described."

Large Cytisus.—Mr. T. O. Walker, of Annas Bank, Carnforth, sent a section cut through the stem of *Cytisus Andreanus* in his garden. The section was not circular, but eccentric, as the S.W. side had died about three years ago. The thickest part of the stem, just about ground level, was 19 inches in circumference, while the bush, which was ten or eleven years from seed, was 11 or 12 feet high, and as much through.

Primula silvicola.—Messrs. Wallace, of Colchester, showed a new *Primula* raised from seed collected by Forrest in Western China, and named *P. silvicola* by Prof. Balfour. It belongs to the same group as the Himalayan *P. mollis*, and has large, rounded, petiolate, hairy

FIG. 51.—LEUCOJUM VAGNERI.

[To face p. xl.

Fig. 52.—Sycamore with branches in whorls of three.

leaves, crenate, dark green, and profusely veined. The inflorescences, of which each plant produces several, bear many tiers of rather irregular flowers, resembling somewhat a dark form of *P. malacoides*, but borne on inch-long pedicels subtended by linear bracts about one-third inch long. Calyx shortly campanulate ; sepals linear, with scariose edges ; corolla throat inflated.

Scilla festalis Bulb.—Mr. Bowles showed an elongated bulb of *Scilla festalis* to draw attention to the manner of growth of the foliage leaves from the base of the bulb.

The Spur-cap in Pears.—Dr. A. S. Horne said: "A little structure which seems to have been overlooked by Dr. Durham in his article relating to the parts of a fruit-tree (*Gardeners' Chronicle*, December 19, 1914), and for which I suggest the name 'spur-cap' or simply 'cap,' is formed by the abscission of the top of the fruit spur in Pears. It leaves a scar larger than that left by the fruit-stalk or peduncle, and is frequently more irregular in outline and may itself bear the scars of one or more fruit-stalks. A number of spur-caps were shed at Wisley in November 1914, and were collected from the ground, but in some cases the absciss layer is not completely formed and the cap is not shed, and may remain in a shrivelled condition at the top of the spur for a considerable time if the latter remain untended. This matter appears to be of some practical importance for the following reasons : (1) When the spur-cap leaves a ragged scar the internal tissue of the spur below the scar is frequently discoloured, fungus mycelium may enter and cause twig-canker (one infected spur was actually observed, February 15, 1915, and bore the fruits of *Nectria cinnabarina*). (2) When the spur-cap is incompletely cut off, the more or less circular gap that separates it from the spur forms an excellent hiding-place for the mycelium of the Pear scab fungus, *Venturia pirina*, and other pests. This structure does not appear to be shed—in most cases, at any rate—in Apples, though I have seen some so shed in 'Manks Codlin.'"

Scientific Committee, March 2, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Leucojum Vagneri.—Mr. W. C. Worsdell, F.L.S., reported that "the entire flowering stem of the *Leucojum Vagneri* shown at the last meeting is undergoing dichotomy or duplication. This involves the formation by each of four flowers instead of two. In some cases the division is not complete, and the appearance is presented of two pedicels and flowers united together.

"In some flowers every alternate whorl was 4-merous, thus: $P\,3+4$, $A\,3+4$, $G\,(\bar{3})$. In one plant which bore three flowers only (due to imperfect duplication of the whole) there was reduction to 2-mery in every alternate whorl of the flower, producing 2/5 phyllotaxis: P 5,

A5, G ($\bar{3}$), the pistil being normal. In one flower a style was separated out—producing partial apocarpy."

Scilla festalis Bulb.—He also reported of the bulb of Bluebell shown at the last meeting: " Instead of the axis of the bulb elongating, the outer scale-leaves have done so to a remarkable extent, and at the top the outermost one or two have become greatly thickened to form a bulb at this level, and this at the expense of the original basal region, which is considerably smaller. Thus, the lateral bulblets, instead of arising in the *axils* of scale-leaves, must arise adventitiously on the upper surface of the scale-leaves; there are two or three such in the top bulb; one of these bulblets is situated about half-way between the two bulbs; there are also two in the normal position in the basal bulb; the upper ones are emitting roots through the scale-leaf tissue."

Seedling Snowdrops.—Mr. H. J. Elwes, F.R.S., showed flowers of seedlings of *Galanthus Elwesii* of very large size and excellent shape, in some instances having the green mark which typically extends to the base of the inner segments falling short of it. Mr. Elwes considered it far better to raise *G. Elwesii* annually from seed than to depend upon its persistence year after year. He also showed some hybrid forms of Snowdrop, and said he thought that apparently all the characters of *G. Elwesii* and probably other bulbous monocotyledons were subject to considerable variation, and it was only by taking the sum of the characters that one species could be distinguished from another.

Variation in Pinguicula caudata.—Mr. Elwes also showed a beautiful pink flower of a seedling of *Pinguicula caudata*, and remarked upon the extent of variation in colour in this species from a dark crimson to pink, and upon the readiness with which the shade form had taken to cultivation after its introduction, while the form which he had found under drier conditions had failed.

Rose Mildew.—Dr. A. S. Horne sent specimens of Roses budded on *Rosa laxa* to show the perithecia of the Rose mildew (*Sphaerotheca pannosa*) on them. The Roses on other stocks which had been attacked by mildew at Wisley had been searched in vain for the perithecia. A few varieties only, particularly ' Madame Gabriel Luizet ' and ' Mrs. Sharman Crawford,' were badly attacked. Many of the perithecia proved to be immature, but several contained mature spores. He did not wish it to be understood that he subscribed to the opinion that the use of *Rosa laxa* rendered Roses more susceptible to attack by mildew; that is possible, but he thought such an expression of opinion would be premature.

Fungus on White Fly.—He also wrote that he suggested the name *Cephalosporium Lefroyi* for the fungus to which he referred at the last meeting as attacking white flies on foliage of *Centropogon* at Wisley, and occurring both on imagos and larvæ. He sent the following technical description of the fungus, for which he was indebted to Messrs. A. Gepp, C. E. Jones, and J. Ramsbottom of the Natural History Museum: " *Cephalosporium Lefroyi*, sp. nov.—Entomogenum albidum; hyphiis sterilibus, septatis, laxe intertextis vel subinde

intricatis, $1{\cdot}7\ \mu - 3{\cdot}4\ \mu$ cr., intervallis brevibus conidiophoras capitatas sparsas ferentibus; conidiophoris simplicibus, septatis vel continuis, $17\ \mu - 27\ \mu$ longis, $1{\cdot}7\ \mu - 2{\cdot}4\ \mu$ latis, fastigatis, unico acrogeno capitulo parum mucoso ornatis; capitulis globosis $\pm\ 3{\cdot}5\ \mu - 7\ \mu$ dia., crebras sporas (quatuordecim pluresve) continentibus; sporis hyalinis, diversiformibus, ellipsoideis, ovalibus vel oblongis, rectis vel leviter curvatis $\pm\ 7\ \mu \times 1 - 1{\cdot}7\ \mu$." On *Aleyrodes vaporariorum* both imago and larva infesting leaves of *Centropogon* in R.H.S. Gardens, Wisley. Differs from *Cephalosporium Lecanii* in colour and in dimensions of conidiophores, capitula, and spores.

Floral Malformations.—Mr. E. Mann, Gill Street, Charters Towers, Queensland, sent examples of *Coreopsis* showing virescence and proliferation of the capitula; *Angelonia* showing virescence; virescent *Antirrhinum*; virescent *Petunia*; virescent *Zinnia*; and proliferous and virescent Pelargoniums; all picked in his garden in December last. He attributed the remarkable number of malformations to the extraordinarily dry season which they had just passed through, but no information was forthcoming as to the purity or otherwise of the stock sown.

Scientific Committee, March 16, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and twelve members present.

Tricotyledonary Sycamores.—Mr. W. H. Fletcher, of Aldwich Manor, Bognor, wrote: "Although at p. 371 of Dr. Masters' 'Vegetable Teratology' mention is made of the fact that seedlings of the Sycamore may often be met with with divided cotyledons, no mention seems to be made of the after-growth of such seedlings. . . . This leads me to send you the following in the hope that it may not be without interest. Under a tree of the red-fruited variety of the Sycamore (*Acer Pseudoplatanus*) in my shrubbery, seedlings with three cotyledons are not uncommon. I have collected some of these and grown them in a cold frame for observation. I find that some of them produce their leaves and axillary shoots in whorls of three so long as the leading shoot remains unbroken. In the photograph sent (fig. 52) ten or twelve of such whorls of three may be more or less clearly traced. The lower part of the stem has been pruned up, but I can still count twenty-eight such whorls. Some of the earlier ones have been lost in the course of growth. The curious fact to my mind is that, though on the main axis the leaves and shoots are all in threes, in every one of these shoots a return is made to the normal decussate arrangement. Though I have found a few with four cotyledons, I have not yet grown one with leaves in whorls of four."

Oak with Fungus Gall.—Mr. Fletcher sent also some branches of *Quercus pedunculata* with roundish swellings here and there along their length. They were apparently immature galls produced by

the fungus *Dichlaena quercina*, the fruits of which had not yet broken through the bark of the shoots.

Orange with lemon-coloured Segments.—Mr. W. C. Worsdell, F.L.S., showed an Orange, part of which was normal in colour, but with a longitudinal segment of lemon-coloured skin, and another quite narrow and almost the colour of the skin of the Blood Orange. Nothing was known of the origin of the fruit except that it was purchased in a shop at Turnham Green. Mr. Bateson suggested that such sports as these probably arise by segregation among the somatic cells similar to that which apparently occurs among the germ cells. In his "Oranges and Lemons of India and Ceylon," p. 345), Dr. Bonavia remarks upon a somewhat similar case in lemons, and figures it on plate 259.

Preparation of Dried Blood.—Dr. J. A. Voelcker remarked upon the directions as to the preparation of dried blood for pot plants contained in the "R.H.S. Gardeners' Diary" for 1915. He found that if blood were allowed to coagulate and then with every 16 lb. of blood 4 oz. muriatic acid and 4 oz. protosulphate of iron were intimately mixed, and the mixture gently heated to 160° F., an inodorous powder would be obtained.

Poultry Manure.—Dr. Voelcker remarked that one of the main difficulties with poultry manure was to obtain it in a sufficiently dry state to handle. He was informed that if it were kept under cover it could be dried with ease, and had found in a sample sent to him: moisture, 22 per cent.; organic matter, 52 per cent.; phosphoric acid, 3·6 per cent.; and ammonia, 6·1 per cent.

Effect of Boron on Plants.—Dr. Voelcker also recounted the results of some experiments he had carried out at Woburn on the effect of boron on plant growth. The experiments had been carried out in glazed pots containing 40 lb. of soil, the crop being Wheat. Both borax and boracic acid, added so as to bring the boron content of the soil up to ·1 per cent. and ·05 per cent., caused death of the wheat grains, while in a second set of experiments, where ·02 per cent., ·01 per cent., and ·005 per cent. of boron in the form of boracic acid was added respectively, no weeds, yellowish-leaved weeds, and one poor sickly wheat plant only developed. The same percentage of boron in the form of borax prevented growth altogether. In all his experiments he had found lithium the most destructive, and lead the least. In his experiments with strontium he found that ·1 per cent. and ·05 per cent. did not interfere with growth, though when added in the form of chloride it had some slight effect.

Hybrid Orchids.—Mr. Gurney Wilson showed on behalf of Messrs. Flory & Black, of Slough, flowers of three plants resulting from the cross *Laeliocattleya* × *bletchleyensis* (*Laelia tenebrosa* × *Cattleya Warscewiczii*) × *Cattleya Trianae.* The flowers were respectively white, white with purple lip, and purple-tinted with purple lip. There was also considerable difference in form.

Crocus biflorus var.—Mr. E. A. Bowles drew attention to a *Crocus*

shown by Messrs. Barr, under the name of *C. biflorus* var. *pusillus*, which was very floriferous.

Bifurcated Oak leaf.—He also showed a leaf of Oak with the lamina bifurcated a quarter of the way above the petiole.

SCIENTIFIC COMMITTEE, MARCH 30, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with eleven members present, and Mr. T. H. CHAPMAN visitor.

Galls of Chermes abietis.—Mr. W. C. Worsdell showed an extraordinarily large growth upon *Abies Nordmanniana*, due to the attack of *Chermes abietis*. The growth on the twig shown was over 1½ inch in diameter.

Azaleas, Early-flowering.—Sir John Llewelyn showed fruits of *Azalea* just ripe, and remarked on the fact that the fruit apparently dehisces naturally in February. He had found titmice eating the seeds in January before they were naturally shed. He is endeavouring to get an early-flowering white *Azalea* somewhat like *Azalea occidentalis*.

Orange with longitudinal yellow Stripes.—Mr. E. M. Holmes exhibited a fruit which he had purchased under the name of Madagascar Bronze Orange, which was a deep bronzy-green except for a stripe of ordinary orange colour about ½ inch in diameter in its widest part; one fruit had two such stripes. He had been told that the fruit came from Spain, where the variety had been grafted upon the common Orange, but could not vouch for the accuracy of the statement.

Natural hybrid Orchids.—Mr. R. A. Rolfe, A.L.S., showed flowers of two crosses he had made in order to satisfy himself of the alleged parentage of two natural hybrid Orchids, viz., *Odontoglossum gloriosum* × *O. Lindleyanum*, which gave *Odontoglossum* × *praevisum*, the natural hybrid; and *O. Lindleyanum* × *O. crispum* (white), which reproduced *O.* × *Coradenei*.

Hybrid Narcissus.—Mr. Chapman, Rye, showed *Narcissus* × *cyclathinus*, the result of a cross between *C. cyclamineus* ♂ and *C. calathinus* ♀. It is a flat-leaved form with flowers like those of *C. cyclamineus* in shape and with reflexed segments, but with a pale colour, the corona being lighter in tint than the perianth—an unusual character in *Narcissus*.

Bulbophyllum dichromum Rolfe.—Mr. J. O'Brien, V.M.H., exhibited a spike of this uncommon Orchid sent him by Sir F. W. Moore, of the Royal Botanic Gardens, Glasnevin. The flowers were, unfortunately, very faded, as they had been cut a fortnight. The species was introduced by Messrs. Sander & Sons, St. Albans, from Annam, through their collector, Micholitz, and first flowered at Glasnevin in February 1907. It appears to be nearest to *B. fuscopurpureum*, native in the Neilgherries, India (see Wight, *Ic. Pl. Ind. Or.* v. p. 6, t. 1651). It is figured in the *Botanical Magazine*, t. 8160.

SCIENTIFIC COMMITTEE, APRIL 13, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Forms of Narcissus Tazetta.—Canon Fowler called attention to two forms of *Narcissus Tazetta* which Messrs. Barr had exhibited, one from a Spanish source, where it apparently grew wild, called *N. Tazetta canaliculatus*, with small yellow and orange-coloured flowers; the other, which had been found growing in an uncultivated place in Wales, with larger, paler flowers, shown as *N.* 'Glandore.' The latter had flowers of a tint and texture which suggested the possibility that *N. biflorus* was one of the parents.

Pelargonium Sport.—Mr. A. Worsley showed a sport of a bright scarlet colour from the Pelargonium 'Double New Life.' Most of the flowers in the truss were single and bright scarlet, but one or two were double and cream, so far as the lower part of the flower was concerned but single and scarlet so far as the dorsal petals went. The leaves opposite the places of origin of the normal and "sporting" trusses were apparently similar.

Primula Reinii.—Mr. E. A. Jenkins showed a well-flowered plant of this pretty and rare species, a native of Japan. It has recently been introduced, and has mauve flowers of the *cortusoides* type, but deciduous foliage more nearly approaching that of *mollis*, especially later in the year. Mr. Jenkins was unable to state whence the plant had come to him.

Paeonia Delavayi.—Mr. Amos Perry exhibited this dark, small-flowered Pæony, which resembles *P. Moutan* in growth, but has deeply-divided leaves and somewhat pendulous flowers. It was introduced by Mr. G. Forrest from Yunnan, where the Abbé Delavay collected it in 1884, and described by Franchet in *Bull. Soc. Bot.* xxxiii. (1886), p. 382. It appears to be hardy in this country and grows naturally at an elevation of about 10,000 feet.

SCIENTIFIC COMMITTEE, APRIL 27, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and fifteen members present.

Roses with Crown Gall.—Mr. J. Fraser, F.L.S., showed some specimens of Rose roots bearing typical spherical galls of about 1 inch or rather more in diameter, produced by the attack of *Bacillus tumefaciens*.

Gall-like growths on Ribes &c.—Mr. W. C. Worsdell, F.L.S., showed specimens of *Ribes*, *Viburnum*, and *Symphoricarpos* with large, gall-like growths at intervals, caused by the development of numerous adventitious roots which had grown out for some little distance, and had then become checked. He stated on the authority of Mr. Geo. Massee that the development of these gall-like masses of adventitious

roots was due to partial suffocation, and occurred in congested portions of the shrubs.

"Fire" in Tulips.—Dr. A. S. Horne showed leaves of Darwin Tulips with the typical symptoms of "fire," due to the attack of *Botrytis parasitica.* He remarked upon the freedom from disease of the plants in some localities, and the abundance of it in others.

Tulipa Fosteriana.—Mr. A. Worsley exhibited flowers of *Tulipa Fosteriana* to call attention to the variation occurring in them, especially in the marking at the base. Mr. Bowles said *T. Fosteriana* was a polymorphous species, and he found no characters so constant as to afford ground for the establishment of varieties. Mr. Worsley also showed a diseased Peach stem, which Dr. Horne took for further investigation.

Colour of Flowers from Reciprocal Crosses.—Mr. Worsley also showed flowers of a hybrid between a garden *Phyllocactus* and *Coreus amaecamensis,* and said that the colour in the reciprocal crosses followed that of the pollen parent in the main. It is to be remarked that the *Phyllocactus* used was of hybrid origin, and would be unlikely to produce offspring like itself.

Eumerus strigatus.—Mr. C. E. Shea exhibited a number of specimens of the lesser Narcissus fly hatched out under glass.

Uncommon Plants.—Mr. H. J. Elwes, F.R.S., remarked upon the desirability of encouraging the growth and exhibition of true species and primary hybrids of hardy plants, and suggested the offer of a Challenge Cup for such exhibits. He asked members to consider the matter and make such suggestions as occurred to them.

Improvement of Pasture.—Mr. F. J. Baker recounted an experience which had just occurred to him with some poor, tussocky grass land. He had sown vetches on the land without turning it up, and many of the seeds had grown. The cattle had eaten the grass and vetches much more readily than they had before eaten the tussocky grass, and this had had the effect of greatly improving the pasturage.

Lissochilus arenarius.—Sir Jeremiah Colman, V.M.H., exhibited this terrestrial Orchid, which has a very wide distribution in tropical Africa, occurring in sandy places and savannahs from Guinea to Natal. The flowers, which are borne in a spike, bear a remarkable resemblance to those of *Impatiens Roylei.*

Fasciated French Beans.—Mr. Ballin sent some French Beans, which, while one-celled in the lower half, divided about the middle into two separate pods, each of which contained seed.

Tricotyledonary Acers.—Mr. J. W. Mackay, forester at Jervaulx Abbey, Middleham, wrote that he had two herbarium specimens of the common Sycamore showing a first whorl of four primary leaves, and four cotyledons (which have fallen from one of the specimens), but in each case the second and succeeding nodes have reverted to the decussate arrangement. He also had an herbarium specimen of the common Beech with three cotyledons and a whorl of three primary leaves, and an Ash with three cotyledons, but the normal number (2)

of primary leaves. Twice he has found stumps of felled Sycamores producing suckers with leaves in whorls of three, but whether the plants continued to produce their leaves in whorls he was unable to say. (See also p. xliii.)

Ribes Species and Hybrids.—Mr. E. A. Bunyard, F.L.S., exhibited the following interesting forms of *Ribes*, for which the Committee tendered him a vote of thanks :—

Ribes alpinum.—Staminate and pistillate. Male form always much more vigorous.

Ribes × *Culverwellii* (*nigrum* × *R. Grossularia*).—Fruit larger than a Black Currant, purple-brown, hairy, with no Black Currant flavour and very rarely produced. Seeds sterile. Raised by W. Culverwell in England, and later by M. Schneider in Germany.

R. robustum (*niveum* × *oxycanthoides*).—Origin unknown. Fruit round, black, large as a currant.

R. orientale.—Fruit round, red, size of Red Currant. Caucasus, Himalayas, and Persia. A pistillate form is known.

R. pinetorum.—Fruit purplish-black, hairy.

Self-sown Dahlias.—Mr. John R. Jackson, of Lympstone, Devonshire, sent seedlings of a collerette Dahlia which had germinated in the old flower-head, the latter having been slightly buried in the autumn digging on an exposed site at Lympstone. Single seedlings are not uncommon, but the present specimens showed several dozens.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 5, 1915.

Mr. JOS. CHEAL, V.M.H., in the Chair, and eleven members present.

There were no recommendations for Awards on this occasion.

Exhibits.

Mr. Batter, Wandsworth: Apple 'Randall's Seedling.'
Mrs. Miller, Marlow: 'Moyleen' preserves.
Messrs. Westmacott, Strand: South African preserves &c.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 19, 1915.

Mr. JOS. CHEAL, V.M.H., in the Chair, and fifteen members present.

There were no recommendations for Awards on this occasion.

Exhibits.

W. Astor, Esq., Taplow: Tomato 'Hastings' × 'Sunrise.'
Messrs. Bunyard, Maidstone: late dessert Apples.
Messrs. Cheal, Crawley: late dessert Apples.
Baron Von Ernsthausen, Ditton: Apple 'Lord Roberts.'
Hon. Vicary Gibbs, Aldenham: late dessert Apples.
Mrs. Miller, Marlow: preserves.
Miss Sewell, Harcourt Terrace, S.W.: preserves.
Messrs. Veitch, Exeter: late dessert Apples.
Messrs. Westmacott, Strand: South African jams &c.

The following late dessert Apples were examined by the Committee:—'Adams' Pearmain,' *'Allen's Everlasting,' 'Belle de Boskoop,' 'Blenheim Orange,' 'Blue Pearmain,' 'Boston Russet,' 'Braddick's Nonpareil,' *'Brownlee's Russet,' 'Claygate Pearmain,' *'Cox's Orange Pippin,' *'D'Arcy Spice,' 'Easter Orange,' 'Fearn's Pippin,' *'Grainger Pearmain,' 'King of the Pippins,' *'King of Tompkins County,' *'Lord Burleigh,' *'Lord Hindlip,' 'Melon Apple,' *'Northern Spy,' 'Roundway Magnum Bonum,' *'Scarlet Nonpareil,' of which those marked with an asterisk were considered the best.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 2, 1915.

Mr. JOS. CHEAL, V.M.H., in the Chair, and fifteen members present.

The Committee inspected and approved of the illuminated address and scarf-pin for presentation to Mr. Geo. Bunyard, V.M.H.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Cannell, Eynsford, for a collection of Apples and Pears.

Silver Knightian Medal.

To Mrs. Denison (gr. Mr. Gentle), Berkhamsted, for a collection of Potatos.

To Mr. Will Tayler, Hampton, for a collection of Apples and Pears.

Other Exhibits.

Messrs. Bunyard, Maidstone: Apple 'Newton Pippin.'

Messrs. Cheal, Crawley: a collection of Apples.

Mr. C. Crooks, Droitwich: Apple 'Chas. Crooks.'

Mr. C. F. Crump, Althorpe: culinary Apples.

Mr. W. Crump, Malvern: culinary Apples.

Mr. J. T. Good, Watford: Apple 'Bushey Grove.'

Sir Albert Rollit, Chertsey: fruiting tree of the Grape Fruit.

Messrs. Veitch, Exeter: late dessert Apples.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 16, 1915.

Mr. JOS. CHEAL, V.M.H., in the Chair, and twelve members present.

Award Recommended:—

Silver Banksian Medal.

To Mrs. Denison (gr. Mr. Gentle), Berkhamsted: collection of Carrots.

The following culinary Apples had been cooked and were examined by the Committee:—'Alfriston,' *'Beauty of Stoke,' 'Belle de Pontoise,' *'Bramley's Seedling,' 'Crawley Beauty,' 'Endsleigh Beauty,' 'Flanders Pippin,' 'Gloria Mundi,' 'Grainger Pearmain,' *'Hanwell Souring,' *'King Edward VII.,' 'Lady Henniker,' 'New Hawthornden,' 'Northern Greening,' *'Lane's Prince Albert,' 'Royal Late Cooking,' 'Stratford White,' and †'Wellington' ('Dumelow's Seedling').

* Varieties of superior merit. † The best variety tried.

The following letter from Mr. Geo. Bunyard, V.M.H., was read:

"The Crossways,
"Mereworth, Maidstone.
"*February* 12, 1915.

"To the Members of the R.H.S. Fruit Committee.

"Gentlemen,—I am deeply grateful for yet another proof of your loyalty to your old Chairman, and shall value the beautiful illuminated address and scarf-pin, which your delegates Messrs. Woodman and S. T. Wright have now handed to me, and treat them as 'Heirlooms' —my family are also very pleased. When eight years back you presented me with that fine enlarged photo which now hangs in the Upper Room of R.H.S., I felt you had done 'all possible,' and it is most gratifying to me to find you still appreciative of the work done (with your assistance) for the benefit of the country. I shall continue to watch your meetings from my retreat. Allow me now specially to thank those who have 'got up' these testimonials and all of you for your co-operation.

"I am,
"Yours faithfully,
"George Bunyard."

Fruit and Vegetable Committee, March 2, 1915.

Mr. A. H. Pearson, V.M.H., in the Chair, and twelve members present.

No Award was recommended on this occasion.

Exhibits.

Sir E. Hambro, Hayes: collection of vegetables.
The Rt. Hon. Lord Hillingdon, Uxbridge: Apples.
Mary, Countess of Ilchester, Holland House: Pear 'Easter Beurre.'
Mr. Peters, Leatherhead: Apple 'Harry Pring.'
Lady Thornycroft, Isle of Wight: Apple 'Lord Roberts.'

Fruit Committee, March 16, 1915.

Mr. Jos. Cheal, V.M.H., in the Chair, and eleven members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To J. Wallers, Esq. (gr. Mr. Tubb), Wokingham, for a collection of Apples.

Other Exhibits.

Mr. W. Divers, M.V.H., Grantham: Apple 'Guernsey Pippin.'
Mr. Miller, Wisbech: Rhubarb 'The Sutton.'

Fruit and Vegetable Committee, March 9, 1915.

The following Awards were made by the Council.

Silver Knightian Medal.

To Messrs. Sutton, Reading, for an exhibit of vegetables.

Silver Banksian Medal.

To Mr. De Luca for an educational exhibit of the various fruits employed in the manufacture of Eau de Cologne, together with samples of the scent prepared from them.

Fruit and Vegetable Committee, March 30, 1915

Mr. A. H. Pearson, V.M H , in the Chair, and twenty members present.

Award Recommended :—

Silver Banksian Medal

To Mrs Denison (gr. Mr Gentle), Berkhamsted, for a collection of root and tuber vegetables.

Other Exhibits.

Mr. Crooks, Droitwich Apple 'Chas. Crooks.'
Mr. Humphreys, Bexley : Apples.
Mr. Miller, Wisbech : Rhubarb 'The Sutton.'

Fruit and Vegetable Committee, April 13, 1915.

Mr. A. H. Pearson, V.M H , in the Chair, and fourteen members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for a collection of vegetables.

Silver Banksian Medal.

To The New Zealand Government Department of Agriculture for a collection of Apples.

Other Exhibits.

Mr. Crooks, Droitwich : Apples.
Mr. Crump, Madresfield Court : Apple 'Sandlin Duchess.'
Mr. Davis, Pershore : Apples.

FIG. 53.—PYRACANTHA CRENULATA (*Gard. Mag.*). (p. liv.)

[*To face p.* lii.

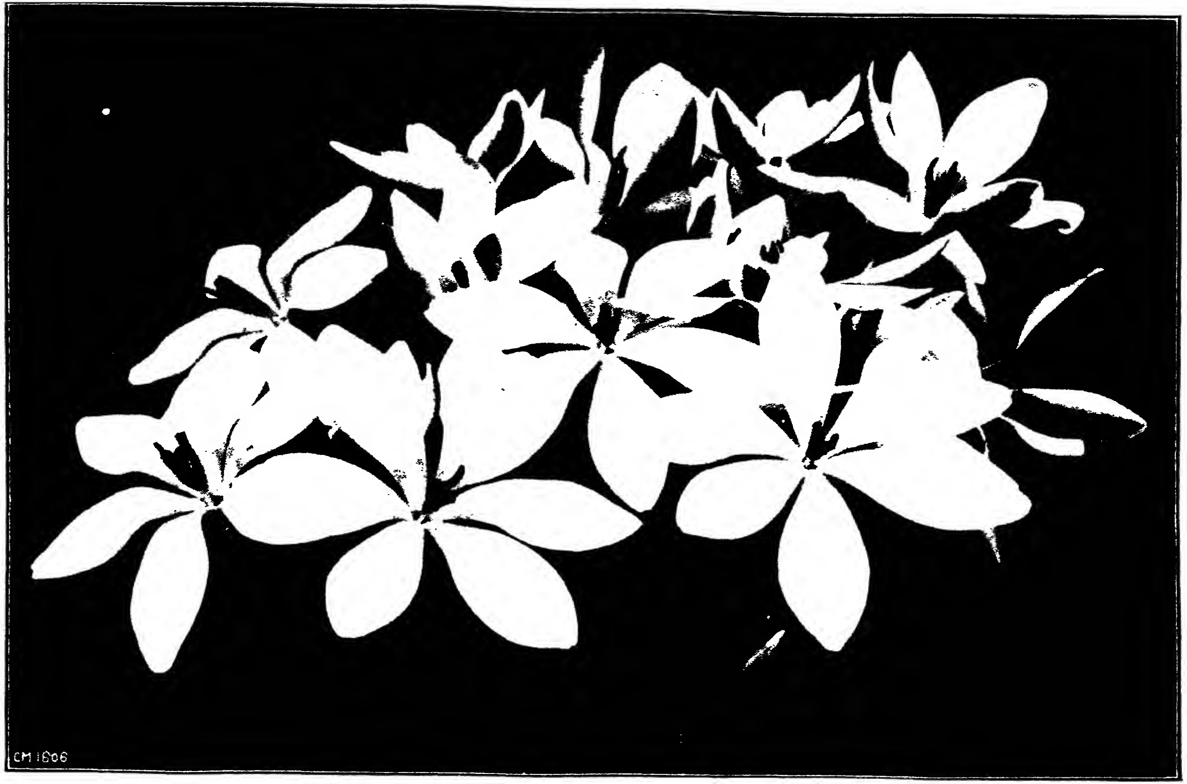

FIG. 54.—CROCUS BIFLORUS ALEXANDRI (*Gard. Mag.*). (p. lvi.)

Fruit and Vegetable Committee, April 27, 1915.

Mr. C. G. A. Nix in the Chair, and eleven members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Potatos.

Other Exhibits.

The Rev. Canon Bernard, Wimborne : seedling Apple.
Mr. Christy, Emsworth : seedling Apple.
Mr. Denniss, Beeston : Apple ' Carlton Frostproof Dessert.'
Mr. Gerrish, Tring : Apple ' Oaklands Seedling.'
Hon. V. Gibbs, Aldenham : Cabbages.

A Sub-Committee, consisting of Messrs. Allen, Bunyard, Cheal, Pearson, Thomas, Williams, and S. T. Wright, was appointed to compile lists of "Standard Fruits."

FLORAL COMMITTEE.

JANUARY 5, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. May, Edmonton, for greenhouse flowering plants and ferns.

Bronze Flora Medal.

To Messrs. Stuart Low, Bush Hill Park, for Carnations.

To Mr. Russell, Richmond, for shrubs.

Award of Merit.

To *Pyracantha crenulata* (votes, unanimous), from Hon. Vicary Gibbs, Aldenham (gr. Mr. E. Beckett, V.M.H.). A handsome Fire thorn. A small tree (the plant exhibited was 13 feet in height), pyramidal in habit, lower branches long, with dark bark, drooping with the weight of fruit; leaves evergreen, glabrous, obovate, older crenulate, younger entire; fruits very freely produced in dense axillary cymes, bright scarlet, $\frac{1}{4}$ to $\frac{3}{10}$ inch in diameter. (Fig. 53.)

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.
Messrs. Barr, Covent Garden: *Galanthus Elwesii* &c.
Messrs. Cannell, Eynsford: Zonal Pelargoniums.
Messrs. Cheal, Crawley: shrubs &c.
Mr. Elliott, Stevenage: alpine plants.
Misses Hopkins, Shepperton: rock plants.
Messrs. Malby, Woodford: photographs.
Miss Pilkington: paintings.
Mr. Reuthe, Keston: miscellaneous plants.
Messrs. Wells & Co., Merstham: Carnation 'Aviator.'

FLORAL COMMITTEE, JANUARY 19, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. May, Edmonton, for epiphytic ferns.

Silver Floral Medal.

To Mr. Perry, Enfield, for hardy ferns.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations &c.

To Messrs. Malby, Woodford, for pomological photographs.

To Messrs. Stuart Low, Bush Hill Park, for Carnations &c.

To Mr. L. R. Russell, Richmond, for shrubs in pots.

To Messrs. Wills & Segar, S. Kensington, for greenhouse flowering plants.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Ware, Feltham, for alpines.

Bronze Banksian Medal.

To Mr. G. Reuthe, Keston, for a group.

Other Exhibits.

Messrs. Barr, Covent Garden: spring flowers.
Mr. Box, Lindfield: rock plants.
Messrs. Cannell, Eynsford: Pelargoniums.
Messrs. Cheal, Crawley: rock plants.
Mr. Elliott, Stevenage: alpine plants.
Messrs. Felton, Hanover Square: *Solanum ciliatum.* **S.C.C.** 1872.
Messrs. Hopkins, Shepperton: rock plants.
Messrs. Waterer, Sons & Crisp, London: rock plants.
Messrs. Wells, Merstham: Carnations and Antirrhinums.

FLORAL COMMITTEE, FEBRUARY 2, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.

Silver Flora Medal.

To Messrs. May, Edmonton, for greenhouse flowering plants.

To Mr. A. Perry, Enfield, for hardy ferns.

To Messrs. Sutton, Reading, for Cyclamen.

To Messrs. Wills & Segar, S. Kensington, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations.

To Mr. Russell, Richmond, for shrubs.

To Messrs. Waterer, Sons & Crisp, Liverpool St., E.C., for rock plants.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Barr, Covent Garden, for hardy flowers.

To Miss Dixon, Edenbridge, for greenhouse plants.
To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.
To Mr. G. Reuthe, Keston, for miscellaneous plants.

Bronze Banksian Medal.
To Mr. J. Box, Haywards Heath, for rock plants.
To Messrs. Piper, Bayswater, for rock plants

Other Exhibits.

Miss M W. Anson, Streatham pictures
Mr. H. Chapman, Rye bulbous plants.
Messrs. Cheal, Crawley: shrubs.
Miss C. M. Dixon, Edenbridge · bulbous plants
Mr. C. Elliott, Stevenage . alpine plants.
Messrs Felton, Hanover Square, W : *Solanum ciliatum.*
The Garden, Tavistock St., W.C.. pictures &c
The Guildford Hardy Plant Nursery, Guildford rock plants.
Misses Hopkins, Shepperton rock plants
Messrs Malby, Woodford photographs.
Miss Ough, Torquay: pictures
Miss Warrington, Streatham pictures
Messrs Wells, Merstham · Carnations

FLORAL COMMITTEE, FEBRUARY 16, 1915

Mr. H B. MAY, V.M H , in the Chair, and twenty-six members present

Awards Recommended :—

Silver Flora Medal
To Messrs Cutbush, Highgate, for flowering shrubs and Carnations.
To Messrs. Cuthbert, Southgate, for Tulips and Azaleas.
To Messrs Malby, Woodford, for photographs of alpine plants.

Silver Banksian Medal.
To Messrs. Barr, Covent Garden, for bulbous flowers.
To Mr. C. Elliott, Stevenage, for alpine plants.
To Messrs. May, Edmonton, for greenhouse flowering plants
To Mr. G. Reuthe, Keston, for miscellaneous plants.
To Mr. L. R. Russell, Richmond, for flowering shrubs.
To Messrs. Waterer & Crisp, Liverpool St., E.C., for rock plants &c.

Bronze Flora Medal.
To Miss Gundry, Foots Cray, for paintings.
To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.
To Mr. Perry, Enfield, for hardy ferns &c.
To Messrs. Piper, Bayswater, for alpine plants.
To Mr. Tucker, Oxford, for alpine plants.

FIG. 55.—CROCUS BIFLORUS 'LEMON QUEEN' (*Gard. Mag.*). (p. lvii.)

[*To face p.* lvi.

FIG. 56.—SAXIFRAGA OPPOSITIFOLIA 'R. M. PRICHARD' (*Gard. Mag.*). (p. lx.)

FIG. 57. SAXIFRAGA × IRVINGII (*Gard. Mag.*). (p. lxi.)

FIG. 58 - FORSYTHIA × INTERMEDIA SPECTABILIS (*Garden*). (p. lxii.)

[*To face p.* lvii.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Miss Dixon, Edenbridge, for Tulips and Hyacinths.

To Mr. Prichard, Christchurch, for alpine plants.

To Messrs. Ware, Feltham, for alpine plants.

To Messrs. Wills & Segar, S. Kensington, for Carnations and Cyclamen.

Award of Merit.

To *Crocus biflorus Alexandri* (votes, 18 for), from Messrs Barr, Covent Garden. A handsome variety of *C. biflorus.* The interior of the flower is white, the back of each outer segment is deep purple-violet with a narrow white margin, the inner segments have only a small patch of purple towards the base of the flower. This is most likely the variety 4 *purpurascens* of HERBERT, *Hist Crocus,* JOURN. HORT SOC. LOND. vol. ii. part iv. p. 286. (Fig 54)

To *Crocus biflorus* 'Lemon Queen' (votes, unanimous), from Messrs. Barr, Covent Garden This pale citron-yellow flowered variety is probably a hybrid between *C. b Weldenii* and *C. chrysanthus.* Forms almost identical with this have appeared in several gardens where these varieties have been grown together The flower shows traces of the outside freckling of *Weldenii* and has the black-dotted anther barbs of *chrysanthus* The stigma is bright orange. (Fig. 55).

To *Crocus Imperati albiflos* (votes, 9 for, 1 against), from Messrs. Barr, Covent Garden A variety of *C. Imperati* with white flowers more or less slightly tinted with purplish-pink. This variety is described and figured in MAWE'S *Monograph Croc.* p 119, and is figured by HERBERT in the collection of drawings now in the Lindley Library.

To *Primula malacoides* 'Rose Queen' (votes, 17 for, 3 against), from Mrs. Denison (gr. Mr. Gentle), Berkhamsted This variety has large, magenta-pink flowers with which the mealy white buds make a pleasing contrast. The plants shown were robust and their numerous peduncles each bore 5 to 7 whorls of flowers

Other Exhibits.

Mr. Box, Lindfield. hardy plants.
Mr. Braggins, S. Kensington: garden plants
Messrs. Cannell, Eynsford: Cinerarias.
Messrs. Cheal, Crawley: shrubs &c.
Messrs. Clark, Dover: Polyanthuses.
Mrs. Fisher, Molesey: paintings.
The Guildford Hardy Plant Nursery: hardy plants.
Mr. V. T. Hill, Langford: alpine plants.
Rev. J. Jacob, Whitewell: Lachenalias.
Misses Hopkins, Shepperton: rock plants.
Mr. Lawson, Halifax: pictures of *Gloriosa superba.*
Mr. Miller, Wisbech: hardy flowers.
Miss Ough, Streatham: pictures.

Misses Price & Fyfe, East Grinstead: Carnations.
Mr. Turner, Slough: *Selaginella Watsoniana.*
Messrs. Wallace, Colchester: miscellaneous plants.
Messrs. Whitelegg & Page, Chislehurst: rock plants.

Floral Committee, March 2, 1915.

Mr. H. B. May, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended:—

Gold Medal.

To Lady Tate (gr. Mr. W. Howe), Streatham, for forced bulbous flowers.

Silver-gilt Flora Medal.

To Mr. L. R. Russell, Richmond, for forced flowering shrubs.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations &c.

Silver Flora Medal.

To Mr. Burnett, Guernsey, for Carnations.
To Messrs. May, Edmonton, for greenhouse plants.
To Messrs. Sutton, Reading, for Primulas.
To Messrs. Waterer & Crisp, Liverpool St., E.C., for rock plants.

Silver Banksian Medal.

To Mr. C. Elliott, Stevenage, for alpine plants.
To Messrs. Low, Bush Hill Park, for Carnations.
To Messrs. Piper, Bayswater, for rock plants.
To Mr. G. Prince, Longworth, for Roses.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Carter, Raynes Park, for Primulas.

Bronze Banksian Medal.

To Messrs. Bakers, Wolverhampton, for rock plants.
To Messrs. Barr, Covent Garden, for bulbous flowers.
To Miss Dixon, Edenbridge, for bulbous flowers.
To Mr. Perry, Enfield, for hardy ferns &c.
To Mr. M. Prichard, Christchurch, for Saxifrages.
To Mr. Reuthe, Keston, for miscellaneous plants.
To Mr. Tucker, Oxford, for rock plants.
To Messrs. Ware, Feltham, for rock plants.
To Messrs. Wells, Merstham, for Carnations.

Award of Merit.

To *Shortia uniflora grandiflora rosea* (votes, unanimous), from Mr. Perry, Enfield. A variety of this Japanese plant bearing rose-pink flowers, upwards of an inch in diameter. The colour is much deeper than that of *S. u. grandiflora* which received an Award of Merit March 8, 1910, and described and figured vol. xxxvi. p. lii. The type is described and figured vol. xxix. pp. 33 et seq. and vol. xxxiv. p. xlii.

Other Exhibits.

Messrs. Cannell, Eynsford: Zonal Pelargoniums.
Messrs. Chapman, Rye: Freesias.
Messrs. Cheal, Crawley: flowering plants.
Messrs. Clark, Dover: Polyanthus.
Misses Hopkins, Shepperton: rock plants.
Misses Price & Fyfe, East Grinstead: Carnations.
Messrs. Sydenham, Birmingham: Lilies.

FLORAL COMMITTEE, MARCH 16, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Hill, Edmonton, for ferns.

Silver Flora Medal.

To Mr. Burnett, Guernsey, for Carnations.
To Messrs. Cuthbert, Southgate, for forced bulbous flowers.
To Messrs. Wm. Paul, Waltham Cross, for Camellias.
To Mr. G. Prince, Longworth, for Roses.
To Messrs. Dobbie, Edinburgh, for Crocuses.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Barr, Covent Garden, for spring flowers.
To Messrs. Cutbush, Highgate, for Carnations &c.
To Mr. C. Elliott, Stevenage, for alpine plants.
To Messrs. Low, Bush Hill Park, for Carnations &c.
To Messrs. May, Edmonton, for greenhouse plants.
To Mr. M. Prichard, Christchurch, for Saxifrages.
To Mr. G. Reuthe, Keston, for miscellaneous plants.
To Messrs. Sutton, Reading, for Hyacinths and Freesias.
To Messrs. Ware, Feltham, for rock and hardy plants.
To Messrs. Wells, Merstham, for Carnations.
To Messrs. Piper, Bayswater, for rock plants.
To Messrs. Tucker, Oxford, for rock plants.

Bronze Flora Medal.

To Mr. L. R. Russell, Richmond, for flowering shrubs.

Bronze Banksian Medal.

To Messrs. Bakers, Wolverhampton, for rock plants.
To Mr. Box, Lindfield, for rock and hardy plants.
To Messrs. Bunyard, Maidstone, for rock plants.
To Misses Hopkins, Shepperton, for rock plants.
To Mr. Miller, Wisbech, for hardy plants.
To Mr. Perry, Enfield, for rock plants.

Award of Merit.

To Carnation 'Good Cheer' (votes, 9 for, 3 against) from Messrs. Wells & Co., Merstham. A perpetual flowering variety stated to be of vigorous habit; the flowers shown had long stiff stalks with broad leaves. The flower is shapely, three inches in diameter; the petals are of good substance, slightly fimbriate, a light shade of rose Neyron red (" Répertoire de Couleurs ").

Saxifraga oppositifolia 'R. M. Prichard' (votes, unanimous). A handsome free-flowering Saxifrage, bearing in great profusion pale pinkish-lilac stellate flowers which exceed an inch in diameter. (Fig. 56).

Other Exhibits.

Messrs. Cannell, Eynsford: greenhouse plants.
Messrs. Clark, Dover: Primroses and hardy plants.
Mr. Hayward, Clacton: Carnation 'Modred.'
J. P. Silwell, Esq., Camberley: *Primula kewensis fl. pl.*
Messrs. Sydenham, Birmingham: bulb flowering in fibre.
Humphrey Talbot, Esq., Berkhamsted: *Zephyranthes carinata.*
Messrs. R. Veitch, Exeter: *Leschenaultia biloba major* and Carnation 'Mme. Chas. Page.'

Floral Committee, March 9, 1915.

Mr. H. B. May, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for Hyacinths.

Silver-gilt Banksian Medal.

To Messrs. Barr, Covent Garden, for Crocus &c.
To Messrs. Carter, Raynes Park, for a spring garden.
To Marquis of Ripon, Kingston Hill, for greenhouse plants.

Silver Flora Medal.

To Mr. C. Elliott, Stevenage, for alpine plants.
To Messrs. Piper, Bayswater, for a rockery exhibit.

FIG. 5[illegible].—PRUNUS (CERASUS) CHEALII PENDULA (*Gard. Mag.*) (p. [illegible])

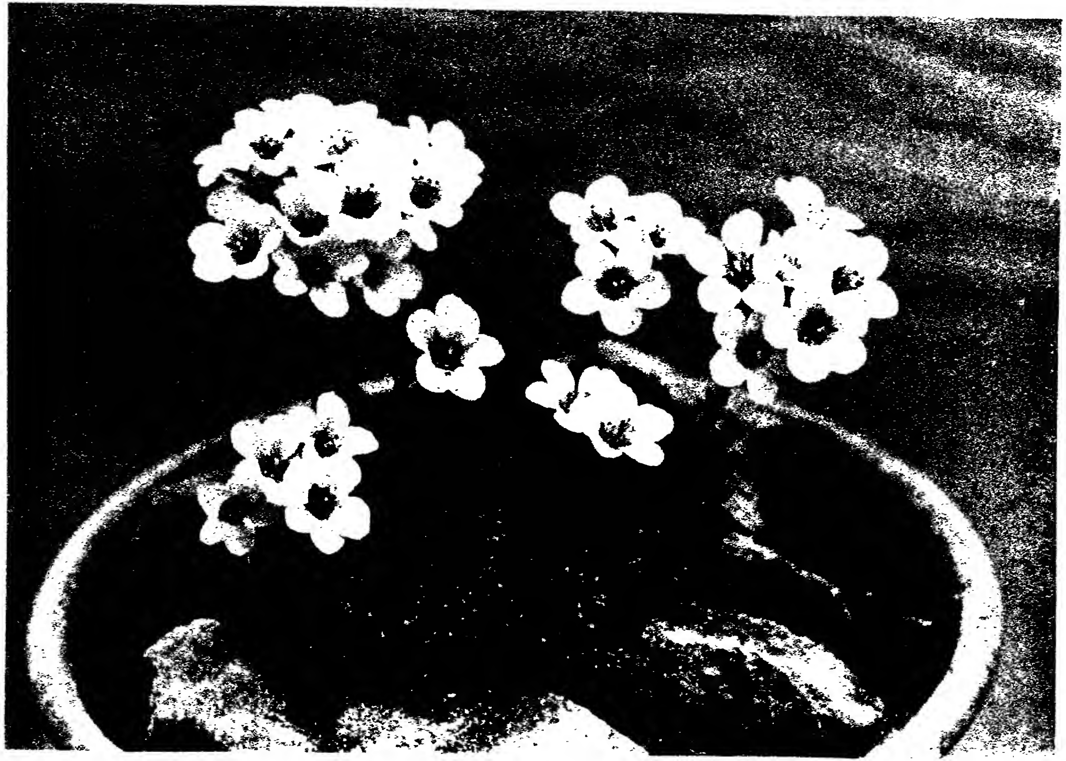

FIG. 60.—SAXIFRAGA VANDELLII (*Tucker*). (p. lxiii.)

[*To face p.* lxi.]

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for flowering shrubs.
To Messrs. Low, Bush Hill Park, for Carnations.
To Messrs. May, Edmonton, for greenhouse plants.
To Mr. G. Reuthe, Keston, for miscellaneous plants.
To Mr. L. R. Russell, Richmond, for flowering shrubs.
To Messrs. Ware, Feltham, for rock plants.
To Messrs. Wills & Segar, for Azaleas.

Bronze Banksian Medal.

To Mr. Gaunt, Farnsley, for alpine plants.
To Mr. M. Prichard, Christchurch, for Saxifrages.
To Messrs. Wallace, Colchester, for Crocus &c.

Award of Merit.

To *Saxifraga* × *Irvingii* (votes, unanimous), from Mr. C. Elliott, Stevenage. This plant was raised at Kew, and is said to be a hybrid between *S. Burseriana macrantha* and *S. Fredericii Augustii.* In habit it closely resembles the first-named parent, but the leaves are shorter, more tufted and pitted; the stem is green, about ½ inch long, and bears a single flower with a distinctly veined, pale pinkish-lilac corolla; the stamens and pistil are reddish. (Fig. 57.)

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.
Mr. Box, Lindfield: rock plants.
Messrs. Gill, Penrhyn: Rhododendrons.
Misses Hopkins, Shepperton: rock plants.
Martin H. F. Sutton, Esq., Reading: *Pycnostachys Dawei.*
Messrs. Sydenham, Birmingham: bulbous flowers.
Messrs. Tucker, Oxford: rock plants.

FLORAL COMMITTEE.—SUB-COMMITTEE AT WISLEY, MARCH 19, 1915.

Two members present.

Awards Recommended:—

Highly Commended.

Sweet Peas for Winter Flowering: No. 32, Waved Pink 1 (= Yarrawa Spencer); No. 70, 'Mrs. R. Ward.'
For descriptions, see Report p. 115.

FLORAL COMMITTEE, MARCH 30, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Carter, Raynes Park, for Crocuses and Daffodils.

Silver Flora Medal.

To Messrs. May, Edmonton, for Clematis &c.
To Messrs. Piper, Bayswater, for flowering shrubs.
To Mr. G. Prince, Longworth, for Roses.
To Messrs. Wells, Merstham, for Carnations.

Silver Banksian Medal.

To Mr. Burnett, Guernsey, for Carnations.
To Messrs. Cutbush, Highgate, for greenhouse plants.
To Mr. C. Elliott, Stevenage, for alpine plants.
To Messrs. Low, Bush Hill Park, for Carnations and Amaryllis.
To Lady Paget (gr. Mr. Savegar), Kingston Hill, for Cinerarias.
To Mr. M. Prichard, Christchurch, for alpine plants.
To Mr. G. Reuthe, Keston, for rock plants.
To Mr. L. R. Russell, Richmond, for flowering shrubs.
To Messrs. Wells and Segar, South Kensington, for greenhouse plants.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. Miller, Wisbech, for spring flowers.

Award of Merit.

To *Forsythia* × *intermedia spectabilis* (votes, unanimous), from Mr. M. Prichard, Christchurch. A highly decorative flowering shrub, the offspring of *F. suspensa* × *F. viridissima*. It differs from *F. intermedia* by its flowers being of a much deeper shade of yellow and borne in even greater profusion. (Fig. 58.)

To Carnation 'Mrs. G. Lloyd Wigg' (votes, 13 for, 2 against), from Messrs. Wells, Merstham. A sport from 'R. F. Felton' (see vol. xxxvi. p. lv), which it resembles closely, except that the flowers are pure white and the plants are taller. It is remarkably fragrant for a white variety.

The Awards to winter-flowering Sweet Peas recommended by the Sub-Committee at Wisley on March 19 were approved.

Other Exhibits.

Messrs. Barr, Covent Garden: spring flowers.
Mr. Box, Lindfield: hardy plants.
Messrs. Carter Page, London Wall: Violas and Annuals.
Messrs. Clark, Dover: Polyanthuses.
Mrs. Denison, Berkhamsted: Acacias and Roses.
F. Ducane Godman, Esq., Horsham: *Tecophilaea Cyanocrocus.*
Misses Hopkins, Shepperton: rock plants.
Miss Mangles, Seale: *Rhododendron eximium.*
Viscountess Ridley, Cramlington: Stock 'Viscountess Ridley.'
Messrs. Sydenham, Birmingham: bulbs forced in fibre.
Messrs. Whitelegg and Page, Chislehurst: rock plants.
Messrs. Young, Hatherley: Carnations.

Floral Committee, April 13, 1915.

Mr. H. B. May, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Carter, Raynes Park, for a spring garden.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for flowering trees.
To Messrs. Cutbush, Highgate, for flowering shrubs.
To Mr. Russell, Richmond, for Clematis.

Silver Banksian Medal.

To Mr. Burnett, Guernsey, for Carnations.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cuthbert, Southgate, for *Azalea occidentalis.*
To Messrs. Low, Bush Hill Park, for Carnations.
To Messrs. May, Edmonton, for Clematis &c.
To Messrs. Waterer and Crisp, Liverpool St., for rock plants.

Bronze Flora Medal.

To Messrs. Barr, Covent Garden, for spring flowers.
To Mr. Douglas, Bookham, for Auriculas.
To Mr. C. Elliott, Stevenage, for alpine plants.
To Mr. Prichard, Christchurch, for alpine plants.
To Messrs. Tucker, Oxford, for alpine plants.

Bronze Banksian Medal.

To Mr. Allgrove, Langley, for herbaceous plants.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. Perry, Enfield, for rock plants.
To Messrs. Whitelegg & Page, Chislehurst, for rock plants.

Award of Merit.

To Auricula 'Edenside' (votes, 12 for, 5 against), from Mr. Douglas, Bookham. A variety with flowers of medium size and substance. Of a singular, dull lilac colour, with a shapely defined, densely farinose, white eye.

To *Primula Reinii* (votes, 14 for, 1 against), from Mr. E. H. Jenkins, Surbiton. A rare and difficult species from Japan. The leaves resemble those of *P. mollis*, and later in the year this resemblance is much more marked. Flower stellate, each petal deeply notched, bright pinkish-lilac, one inch in diameter, borne singly or in pairs at the apex of a slender peduncle of about four inches.

To *Prunus* (*Cerasus*) *Chealii pendula* (votes, unanimous), from Messrs. Cheal, Crawley. A charming weeping tree with long slender branches bearing numerous panicles of four to ten rose-pink double flowers, about one inch in diameter. (Fig. 59.)

To *Saxifraga Vandellii* (votes, 12 for, 2 against), from Messrs.

Tucker, Oxford. A remarkable fine plant of this rare species from the Tyrol. Flowers white, about one half inch in diameter, three to seven in a corymbose inflorescence, petals obovate, entire; peduncle 2 to 3 inches; stems tufted, leaves crowded, ciliate. (Fig. 60.)

Other Exhibits.

Messrs. Baker, Wolverhampton: rock plants.
Messrs. Cannell, Eynsford: Pelargoniums.
Messrs. Carter Page, London: Violas and annuals.
Messrs. Clark, Dover: Primroses.
Mr. Dewrance, Chislehurst: Aubrietia 'Flame.'
Mr. Hill, Langford: rock plants &c.
Misses Hopkins, Shepperton: rock plants.
Elizabeth, Lady Lawrence, Dorking: *Columnea magnifica* and *Pitcairnia Karwinskiana.*
Mr. Miller, Wisbech: hardy plants.
Messrs. Paul, Cheshunt: Lachenalias.
Messrs. Piper, Bayswater: rock plants and flowering shrubs.
Messrs. Reamsbottom, Geashill: Anemones.
Mr. Reuthe, Keston; miscellaneous plants.
Mr. Rossiter, Penarth: Pelargonium 'King George V.'
R.H.S. Gardens, Wisley: Winter-flowering Sweet Peas.
Messrs. Wells, Merstham: Carnations and Antirrhinums.
Messrs. Wills & Segar, South Kensington: greenhouse plants.

FLORAL COMMITTEE, APRIL 27, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for flowering shrubs.

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

Silver Flora Medal.

To Mr. Burnett, Guernsey, for Carnations.
To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Dickson, Newtownards, for Roses.
To Messrs. Paul, Cheshunt, for Roses.
To Mr. Prince, Oxford, for Roses.
To Messrs. Sutton, Reading, for Cinerarias.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cheal, Crawley, for flowering shrubs and rock plants.
To Messrs. Cutbush, Highgate, greenhouse plants and shrubs.

To Mr. Hicks, Twyford, for Roses.
To Messrs. Low, Bush Hill Park, for greenhouse plants.
To Messrs. May, Edmonton, for greenhouse plants.
To Messrs. Piper, Bayswater, for Violas, Pansies, and rock plants.
To Mr. G. Reuthe, Keston, for miscellaneous plants.
To Mr. L. R. Russell, Richmond, for greenhouse plants.
To Misses Tanner & Tait, Bushey, for Schizanthus and Cinerarias.
To Messrs. Wills & Segar, Kensington, for greenhouse plants.

Bronze Flora Medal.

To Messrs. Barr, Covent Garden, for spring flowers.
To Mr. Burch, Peterborough, for Roses.
To Mr. C. Elliott, Stevenage, for alpine plants.
To Mr. M. Prichard, Christchurch, for alpine plants.
To Messrs. Waterer & Crisp, London, for rock plants.
To Messrs. Whitelegg & Page, Chislehurst, for rock plants.

Bronze Banksian Medal.

To Mr. Box, Lindfield, for rock plants.
To Mrs. Lloyd Edwards, Llangollen, for rock plants.
To Messrs. Ware, Feltham, for hardy plants.

Award of Merit.

To *Hydrangea hortensis* 'Radiant' (votes, 15 for, 2 against), from Messrs. Paul, Cheshunt. The plant carried a single very large, rounded truss of large rose-pink flowers.

To *Primula* × 'Adonis' (votes, unanimous), from Mr. Douglas, Bookham. Although the exact parentage was not stated, the plant is no doubt the offspring of *P. viscosa*. Stem six inches; truss globular, many flowered; flower resembling that of *P. carniolica*, about one inch in diameter, light purplish-lilac, throat white (Fig. 60).

Other Exhibits.

Rev. L. C. Barnes, Worksop: Primulas.
Messrs. Cannell, Eynsford: Pelargoniums.
Messrs. Carter Page, London: Violas.
Mr. C. W. Chaplin, Ware: *Viola heterophylla*.
Messrs. Clark, Dover: hardy plants.
Miss Dixon, Edenbridge: rock plants.
Hon. V. Gibbs, Aldenham: Polyanthus.
Misses Hopkins, Shepperton: rock plants.
Messrs. Jarman, Chard: Cinerarias.
Mr. G. Kerswill, Exeter: Gentians.
Mr. Miller, Wisbech: hardy plants.
Messrs. Phillips and Taylor, Bracknell: Auriculas.
Messrs. Reamsbottom, Geashill: Anemones.
Mr. V. Slade, Taunton: Polyanthus.
Messrs. Wells & Co., Merstham: Antirrhinum 'Nelrose.'
Rev. W. Wilks, Shirley: *Anemone nemorosa* 'Anak.'

ORCHID COMMITTEE.

JANUARY 5, 1915.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid orchids.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Cattleya* × 'Maggie Raphael' *alba* and other winter-flowering hybrids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Messrs. McBean, Cooksbridge, for Cymbidiums &c.

To Messrs. J. Cypher, Cheltenham, for Cypripediums.

First-class Certificate.

To *Cypripedium* × 'Christopher' var. 'Grand Duke Nicholas' ('Actaeus' var. 'Miss F. H. Cann' × *Leeanum* 'Corona') (votes, 14 for, 4 against), from G. F. Moore, Esq., Chardwar, Bourton-on-the-Water (gr. Mr. Page). Flower large, whitish green, with the greater part of the dorsal sepal pure white, sparsely spotted with purple.

Award of Merit.

To *Cypripedium* × 'Pyramus' var. 'Chardwar Ideal' ('Hera Euryades' × 'Mrs. Wm. Mostyn') (votes, 13 for, 3 against), from G. F. Moore, Esq. Resembling *C.* × 'Hera Euryades.' Petals and lip yellow, tinged mahogany-brown. Dorsal sepal white, closely blotched with purple.

To *Odontoglossum* × *eximium xanthotes* (*ardentissimum* × *crispum*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier). Flowers pure white, with an occasional orange spot, as in the 'xanthotes' varieties of both parents.

To *Cymbidium* × *Coningsbyanum*, Brockhurst variety (*grandiflorum* × *insigne*) (votes, 13 for, 1 against), from F. J. Hanbury, Esq., Brockhurst, East Grinstead. Flowers on erect spikes, large, cream-white, with rose-purple markings.

To *Cypripedium* × *Arthurianum*, Langley variety (*Fairrieanum* × *insigne* 'Harefield Hall') (votes, 13 for, 1 against), from Messrs. Flory & Black, Slough. Larger and more heavily marked than the original, which was awarded F.C.C., Oct. 10, 1882. The variety now shown had the broad dorsal sepal white, with green base and large rose-purple blotches.

Cultural Commendation.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bt., for a fine specimen of *Odontoglossum* × *eximium xanthotes* with twenty-seven flowers.

Other Exhibits.

J. Gurney Fowler, Esq.: *Cattleya* × 'Phyllis' (*Luddemanniana Stanleyi* × *Schroederae*).

Sir Jeremiah Colman, Bt.: Odontiodas.

Baron Bruno Schröder: *Cypripedium* × *Hera-Beeckmanii.*

R. G. Thwaites, Esq.: hybrids.

H. S. Goodson, Esq.: Odontoglossums.

F. J. O. Montagu, Esq.: *Cypripedium* × 'Archimedes.'

Messrs. Flory & Black: *Laeliocattleya* × 'Queen Elizabeth' (*L.-c. Gottoiana* × *C.* 'Carmen').

Messrs. Hassall: Laeliocattleyas.

ORCHID COMMITTEE, JANUARY 19, 1915.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for Cattleyas and Cypripediums.

Silver Banksian Medal.

To Messrs. Sander, for hybrids and interesting species.

To Messrs. Stuart Low, Jarvisbrook, for Dendrobiums, Odontoglossums, &c.

To Messrs. McBean, Cooksbridge, for Cymbidiums &c.

First-class Certificate.

To *Brassocattleya* × *Cliftonii albens* (*B.-c.* × Digbyano-Mossiae 'Queen Alexandra' × *C. Trianae alba*) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). A large flower of perfect shape, white, with a slight rose tint on the backs of the sepals, the disc of the lip being pale yellow.

To *Dendrobium* × 'Triumph' (*Dalhousieanum* × *thyrsiflorum*) (votes, 9 for, 4 against), from J. Gurney Fowler, Esq. In habit and flower near to *D. Dalhousieanum*, but the growth differs in the tendency to thicken in the lower part and in the thicker, more petiolate, and more sparsely distributed foliage. The flowers are white, with a reddish purple band across the middle of the lip, and not in blotches on the sides as in *D. Dalhousieanum.*

Other Exhibits.

J. Gurney Fowler, Esq.: *Odontioda* × 'Latona,' Fowler's variety, and young hybrid orchids showing remarkable growth.

His Grace The Duke of Marlborough, Blenheim Palace (gr. Mr. Hunter): *Cypripedium* × 'Euphemia' ('Hera Euryades' × 'Earl of Tankerville'), and *C.* × 'Iona.'

Baron Bruno Schröder (gr. Mr. J. E. Shill): *Cattleya Trianae* 'Dorothy.'

Sir M. E. M. Buller: *Sophrocattleya* × *Wellesleyae.*

Messrs. Flory & Black, Slough: *Cymbidium* × *Floryi* (*grandiflorum* × *eburneo-Lowianum*) and hybrid Cypripediums.

Orchid Committee, February 2, 1915.

Mr. J. Gurney Fowler in the Chair, and nineteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for finely-flowered Orchids.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Cattleya* × 'Maggie Raphael' *alba* and other hybrids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for *Laeliocattleyas*, hybrid Odontoglossums, &c.

To Messrs. Cypher, Cheltenham, for Cypripediums.

To Messrs. McBean, Cooksbridge, for a group.

To Messrs. Stuart Low, Jarvisbrook, for a group.

Award of Merit.

To *Cattleya Trianae alba* 'Queen Elizabeth' (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Tunbridge Wells (gr. Mr. J. Davis). A true albino, of fine size and shape, the petals and lip crimped at the margin.

Other Exhibits.

Baron Bruno Schröder: *Cattleya Trianae* 'The Baroness.'

J. Gurney Fowler, Esq.: Odontiodas &c.

Pantia Ralli, Esq.: *Odontoglossum* × *amandens.*

Richard Ashworth, Esq.: *Odontoglossum Cervantesii decorum.*

Messrs. Hassall: *Brassocattleya* × 'Menda.'

Messrs. Flory & Black: *Odontioda* × *Simone* (*Odontioda* × *Bradshawiae* × *Odontoglossum* × *Vuylstekei*).

Orchid Committee, February 16, 1915.

Mr. J. Gurney Fowler in the Chair, and twenty-three members present.

Awards Recommended :—

Silver Flora Medal.

To Sir Jeremiah Colman, Bt. (gr. Mr. Collier), for Cymbidiums.

To Messrs. Charlesworth, Haywards Heath, for finely-flowered Orchids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for *Cattleya Trianae* and hybrids.

To Messrs. Stuart Low, Jarvisbrook, for Dendrobiums and hybrids.

To Messrs. McBean, Cooksbridge, for white *Laelia anceps* and Cymbidiums.

Award of Merit.

To *Cymbidium* × *Schlegelii*, Fowler's variety (*insigne* × *Wiganianum* (votes unanimous) from J. Gurney Fowler, Esq., Brackenhurst,

Pembury (gr. Mr. J. Davis). The largest variety. Flowers cream-white, tinged and lined with pale rose, the lip spotted with claret-colour, the markings being arranged similarly to *C. Tracyanum*, which, with *C. eburneum*, was a parent of *C.* × *Wiganianum*.

To *Odontoglossum* × *sandhurstiense* (*coronarium* × *Edwardii*) (votes unanimous), from C. J. Phillips, Esq., Sevenoaks (gr. Mr. Bucknell). A very remarkable cross, nearest to *O. coronarium*, and with roundly arranged flowers of the same leathery texture. Colour deep purplish chocolate, with a lighter apex to the lip.

To *Odontioda* × 'Patricia' (*Odontoglossum* × 'Phoebe' × *Odontioda* × *Charlesworthii*) (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Sepals and petals bright ruby red; lip white, with ruby-red blotches.

Other Exhibits.

J. Gurney Fowler, Esq.: *Cypripedium* × 'Ernest Read.'

Pantia Ralli, Esq.: *Odontoglossum* × *crispo-Wiganianum* 'Buttercup.'

Baron Bruno Schröder: forms of *Cattleya Trianae*.

C. J. Phillips, Esq.: *Cattleya Trianae* 'Lord Kitchener.'

Messrs. Charlesworth: spikes of *Odontioda* × 'Amata' (*Bohnhoffiae* × *Charlesworthii*) showing remarkable variation in colour and shape.

Messrs. Hassall: various Orchids.

Messrs. Mansell & Hatcher: *Odontioda* × 'Joan,' Rawdon variety.

Orchid Committee, March 2, 1915.

Mr. J. Gurney Fowler in the Chair, and twenty-five members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for Cypripediums &c.

To Messrs. Sander, St. Albans, for hybrids, *Cattleya Trianae*, &c.

To Messrs. McBean, Cooksbridge, for a group.

To Messrs. Stuart Low, Jarvisbrook, for Dendrobiums and hybrids.

First-class Certificate.

To *Brassocattleya* × *Digbyano-Schroederae*, Shrubbery variety (*B. Digbyana* × *C. Schroederae alba*) (votes unanimous), from F. Menteith Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). Flower white, the extraordinarily large and broad labellum fringed.

Award of Merit.

To *Cattleya* × 'Olympus' ('Octave Doin' × *Warscewiczii*) (votes 16 for, 0 against) from Messrs. Flory & Black, Slough. Flowers near to *C. Warscewiczii*, tinged with rose-purple. Lip reddish purple, with yellow blotches on each side of the disc.

Other Exhibits.

J. Gurney Fowler, Esq.: *Cattleya Trianae* 'Griselda.'
Baron Bruno Schröder: *Cymbidium Pauwelsii.*
F. J. Hanbury, Esq.: Dendrobiums.
The Rev. H. G. Monro: *Phaius Blumei.*
Messrs. Flory & Black: Cypripediums.
Messrs. Hassall: hybrids.

Orchid Committee, March 16, 1915.

Mr. J. Gurney Fowler in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, for finely-grown specimens.
To Messrs. Sander, for hybrids and interesting species.

Silver Banksian Medal.

To Messrs. Stuart Low, for a group.
To Messrs. Hassall, for five specimens of *Angraecum sesquipedale* &c.
To Messrs. McBean, for a group.

Bronze Banksian Medal.

To Mr. H. Dixon, for hybrids &c.

Award of Merit.

To *Lycaste* × 'Janetae' (*Rossiana* × *Skinneri*) (votes 16 for, 1 against), from Messrs. Sander, St. Albans. Flowers as large as those of *L. Skinneri*, cream-white, with small rose spots.

To *Brassocattleya* × *Cliftonii* var. 'Sir John French' (*B.-c.* × *Digbyano-Mossiae* × *C. Trianae*) (votes unanimous), from Messrs. Stuart Low. Flowers of fine shape, pink, with orange disc to the lip and small purple blotch in front.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Odontioda* × 'Lady Colman' (*C. Noezliana* × *O.* × 'Queen of Gatton').

J. Gurney Fowler, Esq.: *Odontoglossum* × 'Amethyst,' Glebelands variety.

Pantia Ralli, Esq.: *Odontoglossum* × *Farnesii.*
Mrs. Norman Cookson: *Odontioda* × 'Sybil.'
Geo. W. Bird, Esq.: Odontiodas and Odontoglossums.
C. J. Lucas, Esq.: *Odontoglossum* × *ardentissimum* 'Eric.'
R. G. Thwaites, Esq.: hybrids.
Messrs. Flory & Black: hybrids.

Orchid Committee, March 30, 1915.

Mr. J. Gurney Fowler in the Chair, and twenty-three members present.

Awards Recommended:—

Gold Medal.

To J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis), for a remarkable display of Dendrobiums arranged on the wall at the end of the Hall, and in which between 300 and 400 plants were used. The staging beneath had rare Orchids in flower arranged with Maidenhair Ferns.

Silver Flora Medal.

To Messrs. Charlesworth, for fine hybrids.

To Messrs. Sander, for hybrids and interesting species.

Silver Banksian Medal.

To Messrs. J. Cypher, for a group.

To Messrs. McBean, for Cymbidiums &c.

To Mr. Harry Dixon, for a group.

To Messrs. Stuart Low, for a group.

First-class-Certificate.

To *Laeliocattleya* × 'J. F. Birkbeck,' Fowler's variety (*C. Mendelii* × *L.-c.* × 'Hy. Greenwood') (votes unanimous), from J. Gurney Fowler, Esq. (gr. Mr. J. Davis). A very fine hybrid with flowers of true Cattleya form and substance. The broad sepals and petals are cream-white, with a slight blush tint, the broad crimped labellum rose-purple.

To *Odontoglossum* × 'Mars' (parentage unrecorded) (votes unanimous), from J. Gurney Fowler, Esq. One of the finest of the *O. illustrissimum* class. Flowers reddish claret, with a narrow white margin.

Cultural Commendation.

To Mr. J. E. Shill, gr. to Baron Bruno Schröder, for a large specimen of *Odontoglossum* × *crispo-Harryanum* with three spikes bearing together forty flowers.

To Mr. Balmforth, gardener to F. M. Ogilvie, Esq., for a group of 30 plants of the fine yellow *Dendrobium Thwaitesiae*, Veitch's variety

Other Exhibits.

Baron Bruno Schröder: *Odontioda* × 'Cardinal.'

J. Gurney Fowler, Esq.: new Dendrobium hybrids.

F. M. Ogilvie, Esq.: *Brassocattleya* × *Cliftonii magnifica*.

Sir Jeremiah Colman, Bt.: Dendrobiums.

Messrs. Armstrong & Brown: *Odontioda* × *Armstrongii*.

Messrs. Flory & Black: hybrids.

Messrs. Davidson: *Sophrolaeliocattleya* × 'Niobe.'

Orchid Committee, April 13, 1915.

Sir Harry J. Veitch in the Chair, and twenty-three members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.
To Messrs. Sander, St. Albans, for species and hybrids.
To Messrs. Hassall, Southgate, for Cattleyas, Odontiodas, &c.
To Messrs. Stuart Low, Jarvisbrook, for a group.
To Mr. H. Dixon, Wandsworth Common, for a group.

Award of Merit.

To *Odontioda* × *Zenobia Leeana* (*Odontoglossum percultum* × *Odontioda* × *Charlesworthii*) (votes unanimous), from W. R. Lee, Esq., Plumpton Hall, Heywood, Lancs. (gr. Mr. Branch). Flowers bronzy-claret ; lip rose at the base, white in front.

To *Odontoglossum* × 'Leviathan' (parentage unrecorded) (votes 17 for, 6 against), from W. R. Lee, Esq. A gigantic flower, white tinged with rose, and with dark red-brown markings on the inner two-thirds of the segments.

To *Laeliocattleya* × *Nena* (*warnhamensis* × *Dominiana langleyensis*) (votes 15 for, 2 against), from Messrs. Flory & Black, Slough. A floriferous hybrid with copper-orange flowers with dark claret lip.

Cultural Commendation.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bt., for a many-flowered specimen of *Masdevallia Kimballiana Pourbaixii.*

Other Exhibits.

W. H. St. Quintin, Esq. : *Brassocattleya* × 'Vanessa.'
R. G. Thwaites, Esq. : hybrid Odontoglossums.
C. J. Phillips, Esq. : *Odontoglossum* × *Phillipsianum.*
Messrs. Flory & Black : hybrids.

Orchid Committee, April 27, 1915.

Mr. J. Gurney Fowler in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums and Odontiodas.

To Messrs. Stuart Low, Jarvisbrook, for Dendrobiums.

To Messrs. McBean, Cooksbridge, for hybrids.

To Messrs. Cypher, Cheltenham, for many Masdevallias and showy hybrids.

To Messrs. Hassall, Southgate, for a group.

Bronze Banksian Medal.

To Mr. Harry Dixon, Wandsworth, for Odontoglossums &c.

First-class Certificate.

To *Brassocattleya* × *Cliftonii*, Fowler's variety (*B.-c.* × *Digbyano-Mossiae* × *C. Trianae*) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). A noble white flower with chrome-yellow disc to the fringed lip, which has a purple blotch in front. It is interesting to record that Mr. J. Gurney Fowler showed the same plant with two flowers on a previously-made growth, March 30; the younger growth, then under development, now bearing one bloom.

Award of Merit.

To *Brassocattleya* × *Vilmoriniana*, Shrubbery variety (*B.-c.* × 'Mrs. J. Leemann' × *C. Mossiae*) (votes unanimous), from F. Menteith Ogilvie, Esq., Oxford (gr. Mr. Balmforth). Flowers bright-purplish rose, with yellow disc to the lip.

To *Laeliocattleya* × 'Isabel Sander,' Gatton Park variety (*L.-c.* × *Canhamiana alba* × *C. Mossiae Reineckiana*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park, Surrey (gr. Mr. Collier). Flower of good shape and substance, white, with some pink markings on the front of the lip.

Other Exhibits.

The Earl of Craven: *Laeliocattleya* × *corneliensis* (*L.-c.* × *Haroldiana* × *C. Schroderae*).

Sir Jeremiah Colman, Bt.: Dendrobium flowers and other Orchids.

F. M. Ogilvie, Esq.: *Cattleya Mendelii* 'Queen Mary.'

Baron Bruno Schröder: *Laeliocattleya* × 'Ivanhoe' (*L.-c.* × *eximia* × *C. Dowiana*).

G. W. Bird, Esq.: *Odontioda* × 'Sensation' (*Odontioda Vuylstekeae* × *Odontoglossum crispum* var.).

Walter Cobb, Esq.: hybrids.

R. G. Thwaites, Esq.: Odontoglossums &c.

Messrs. Flory & Black: hybrids.

W. Potter, Esq.: *Dendrobium* × 'Apollo' *album* flowers.

ESTABLISHED 1804.

INCORPORATED 1809.

TELEGRAMS: "HORTENSIA SOWEST LONDON."

TELEPHONE: VICTORIA 5363.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. General.
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29. Disbudding Chrysanthemums.
30. Advertisements.

Douglas' Journal, *see* page lxxxiv.

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1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W., except those specially connected with Wisley, which should be addressed—The Director, R.H.S. Gardens, Wisley, Ripley, Surrey.

3. TELEPHONE AND TELEGRAMS.

Telephone Number: **VICTORIA 5363.**

"**HORTENSIA SOWEST LONDON**" is sufficient address for telegrams. This address counts as two words only.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted:—

Vols. I. to VI.	Vol. XIII. Part 1.
Vol. X.	Vol. XIV.

These are, therefore, particularly asked for.

5. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays the full amount of his subscription for the year commencing the 1st day of January then next, and no further subscription until the next succeeding 1st of January. To avoid the inconvenience of remembering their subscriptions Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £.........., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease ; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

See page 126 in the "Book of Arrangements," 1915.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once.

9. NEW FELLOWS.

The increasing number of Fellows shows plainly the useful work the Society is doing, and its value to all lovers of the Garden. The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as it is most important to fill the places of those who are taken from us.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by :—

1. Increasing the Number of Fellows.
2. Help towards the Wisley Endowment.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to make up this sum ?

3. Providing Lectures with Lantern Slides.

4. Presenting Books for the Library at Vincent Square and at Wisley.

5. Sending new or rare Plants and Seeds for the Garden, Sedums for nomenclature purposes, and surplus Roots for distribution to the Fellows.

The Secretary asks for help in the ways above indicated.

11. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1916 will contain a considerable quantity of new information, and is compiled more especially for the single-handed gardener. Fellows may obtain it in November post free, 1*s.* 1*d.*, from the R.H.S. Office, Vincent Square, London, S.W.; or 2*s.* 1*d.* if leather-bound.

12. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the Annual Meeting in 1914 for the further development of the practical and scientific work at Wisley, Fellows will be pleased to know that the Council have been fortunate in securing the services of Dr. Keeble, F.R.S., as Director, of Professor Lefroy, M.A., of the Imperial College, as Entomologist, and of Mr. Harold J. Page, B.Sc., as Chemist. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of the Society and the Imperial College. All communications to the Gardens should in future be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

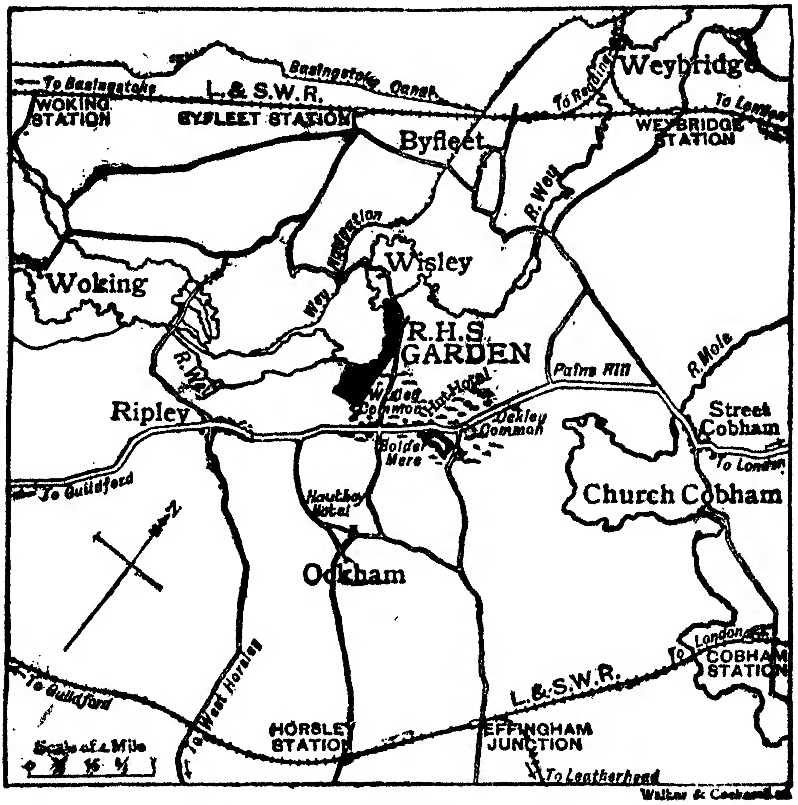
Mr. F. J. Chittenden, F.L.S., who has done such splendid work in the Laboratory and as Head of the School of Horticulture since 1907, will still continue in this capacity under the re-organization scheme, and Mr. Wright will similarly continue his work in the Garden.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*; or to and from Horsley, Effingham, or Byfleet, 7*s.* Motor cars will be found at Byfleet Station, 7*s.* 6*d.* the

return journey. Accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy, Ockham.

For the motor route from London, 21 miles from Hyde Park Corner, see "Book of Arrangements," p. 166.



Position of the Society's Gardens.

13. ROCK GARDEN AT WISLEY.

In response to the interest taken in what are popularly called "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that.

An Alpine House has been built above the Rock Garden, for the purpose of growing rock plants to perfection which blossom too early to withstand our wet winters and late spring frosts.

14. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

15. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded ; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants ? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the " Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot ; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out

of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

16. TRIALS AT WISLEY.

The Regulations for the Trials at Wisley have been revised, with a view of improving this important branch of the Society's work. For fuller information concerning them and the list of subjects invited for trial in 1915, 1916, and 1917, *see* pages 42 and 167, *et seq.*, "Book of Arrangements" for 1915.

17. EXHIBITIONS, MEETINGS, AND LECTURES, 1915.

The Programme will be found in the "Book of Arrangements" for 1915. A reminder of every show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (34) of halfpenny cards *ready addressed* to himself.

18. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners will welcome the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations which will be required. The Diploma is thoroughly "National," for by the consent of H.M. Government, the Department of Agriculture, after being approached on the matter, consented to cooperate with the Society if the Society would undertake the work of organizing the Examinations, and authorized that the Diploma shall

bear the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations are practical, viva voce, and written. The practical part is held in suitable gardens at convenient centres in the country. A Preliminary Examination (the first was held in June 1914) will be held annually. The first Final Examination was held in June 1915. Both Examinations will in future be held annually in June or thereabouts. The Final is open only to those who have passed the Preliminary and can produce a Certificate showing they have been employed regularly for not less than six years in the Practice of Horticulture.

Among those for whose benefit the Diploma is established are the following:—Florists, Fruit Growers, Gardeners, Horticultural Inspectors, Horticultural Instructors (not School Teachers giving instruction in other subjects), Landscape Gardeners, Market Gardeners, Nurserymen, Public Park Gardeners, and Seedsmen.

Full information may be obtained from the Secretary, Royal Horticultural Society, Vincent Square, S.W.

19. EXAMINATIONS, 1916.

1. The Annual General Examination in the Principles and Practice of Horticulture will be held on March 8, 1916. It has two divisions, viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Particulars for 1916 may be obtained by sending a stamped and directed envelope to the Society's offices. Copies of the Questions set from 1893 to 1915 (price 2*s*. post free) may also be obtained from the office. The Society is willing to hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Worshipful Company of Gardeners, to be awarded after the 1916 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 12, 1916. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken

in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The conduct of this Examination is on similar lines to that of the General Examination. Questions on Elementary Chemistry and Biology are included.

Medals and Certificates are awarded, and Class Lists published, in connexion with these Examinations.

20. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

21. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3*s.* for one day (or £5 5*s.* for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner.*

22. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 330 Societies have joined our ranks, and the number is steadily increasing.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100. At the request of several of the Affiliated Societies, the Council have had the Certificate Card coloured. The coloured Card is sold at 8*d.* a single copy, or 10 for 5*s.*, post free.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case

complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d.* each.

23. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. It contains a useful Index and several important amendments. Special attention is drawn to the new "Rules for Judging Cottage and Allotment Gardens," with the companion "Judges' Point Sheet" (see paragraph 29), and a "Classification of Stove, Greenhouse, and Hardy Plants for Show Purposes." The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 6*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

24. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment Holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at twopence a copy, or fifty for 7*s.* 6*d.*

A companion Judges' Sheet in a very convenient book-like form can also be had for 2*s.* a dozen. This Judges' Sheet has, in tabulated form, a list of the plants usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given.

25. R.H.S. DAFFODIL YEAR BOOK.

The Daffodil Year Books of the Society are amongst the most interesting works on gardening. The first issue (1913) was sold out within a month of publication. Of the 1914 issue but few copies remain unsold. The 1915 Year Book will be ready in August. It will be an excellent volume, and full of interesting and valuable information, and well illustrated. No Daffodil Grower can now afford not to consult this publication if he wishes to keep abreast of the times in the Daffodil world.

26. R.H.S. PUBLICATIONS.

In future, Fellows can obtain the Society's publications only from the R.H.S. Office, Vincent Square, S.W. Non-Fellows should order direct from Messrs. Wesley, 28 Essex Street, Strand, W.C., who have been appointed Agents for the Society.

27. R.H.S. PAMPHLETS.

The following pamphlets can be ordered or obtained from the R.H.S. Office, Vincent Square, London, S.W. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. The prices of *each* are as follows:—Single Copy, *2d.*; 25, *2s.*; 50, *3s.*; 100, *4s.*:—

(1) Small Fruits for Cottage and Allotment Gardens.
(2) The Training of Fruit Trees.
(3) Vegetables and How to Grow Them in Small Gardens and Allotments.
(4) Flowers for Small Gardens, Window Boxes, and Wall Decorations.
(5) Hardy and Half-Hardy Annuals in the Open Air.
(6) Bottling Fruits.
(7) Vegetable Cookery.
(8) Salads and Salad Making.

28. DISBUDDING OF ORCHIDS.

At the request of the Orchid Committee the Council have made a rule that "Awards will not be given to any Orchids of which the natural size and character of the flowers have, in the opinion of the Orchid Committee, been in any way changed or improved through the removal of a bud or buds, or part of the spike."

29. DISBUDDING CHRYSANTHEMUMS.

When single-flowered Chrysanthemum plants are submitted for certificate, one plant must be shown without any disbudding whatsoever, and one plant somewhat disbudded, in order that the quality of the blooms on the undisbudded stems may be compared with those on the disbudded stems.

30. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

DOUGLAS' JOURNAL.

At the request of the U.S.A. Department of Agriculture the Society has recently published the Diary kept by David Douglas nearly a hundred years ago of his exploration of the wildest parts of North and North-Western America, whither the Society had sent him chiefly with a view to the introduction of new plants. It will be found to be vastly interesting, not only on account of the extraordinary number of the plants he discovered, but also on account of the topographical notes it contains and the evidence it affords of the condition of the country and of the Indians a hundred years ago. It is published by Messrs. Wesley & Son, Essex Street, Strand, London. Price £1 1s.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

May 11, 1915.

Dr. Frederick Keeble, F.R.S., in the Chair.

Fellows elected (51).—D. H. Baird, D. Bannister, Miss D. Barclay, Mrs. Barlow, W. H. Bishop, W. Bristol, J. S. Christie, Miss A. Day, Mrs. G. Doyne, Mrs. B. Drysdale, Mrs. Evans, J. E. Fawcett, Miss Halford, Hon. Mrs. Handford, Mrs. W. Harris, Mrs. Hoseason, H. J. Hunt, Rev. R. Stuart King, J. King, Hon. Gerald Lascelles, C.B., H. P. Leach, Capt. J. C. G. Leigh, Mrs. Gerard Leigh, Mrs. McCormick-Goodhart, Mrs. Marriott, Dow. Lady Milbanke, Mrs. H. Morant, Mrs. Murray Morrison, Mrs. C. Murphy, Mrs. S. Newman, J. H. B. Noble, W. Palmer, Mrs. H. Payne, Mrs. V. Porter, Mrs. F. Pratt Barlow, Miss A. Prichard, Mrs. Ravenhill, F. C. H. Snead, Mrs. H. Spencer, H. G. Stacey, H. J. Taylor, Mrs. W. Trimmer, Mrs. E. Wade, W. H. Wallace, W. Ward, T. H. Webster, Mrs. Ashley Westby, Mrs. P. Wheeler, H. F. White, R. N. White, Mrs. R. Yeats.

Associates (3).—A. Hutton, A. Lampard, Miss Mercer.

A lecture on "Inheritance" was given by Mr. W. Bateson, D.Sc., F.R.S.

TULIP SHOW.

May 13, 1915.

List of Awards.

Gold Medal.

Messrs. Barr, King Street, Covent Garden, W.C.

Silver Cup.

Messrs. Dobbie, Edinburgh.

Standard Cup.

Canon Fowler, Earley, Reading.

Silver-gilt Flora Medal.

Messrs. Bath, Wisbech.
Messrs. Hogg & Robertson, Dublin.
Messrs. Wallace, Colchester.

Silver-gilt Banksian Medal.

Messrs. Waterer, Bagshot.

Silver Flora Medal.

Mr. C. Bourne, Bletchley.

Silver Lindley Medal.

A. D. Hall, Esq., Merton, S.W.
Messrs. W. T. Ware, Feltham.

Certificate of Appreciation.

Mr. W. T. Ware, for work in raising new varieties of Tulip.

CHELSEA SHOW.

MAY 18, 19, 20, 1915.

LIST OF JUDGES.

ORCHIDS.

Amateurs' Exhibits.

Bolton, W.
Cypher, J., V.M.H.
Charlesworth, J.
Sander, F., V.M.H.

Nurserymen's Exhibits.

Fowler, J. Gurney
Shill, J. E.
Moore, Sir F. W., V.M.H.
Crawshay, de Barri

ROSES.

Page Roberts, Rev. F.
Jennings, John
Orpen, O. G.

CARNATIONS.

Turner, Arthur
Barnes, N. F.
Blick, C.

TULIPS.

Hall, A. D., F.R.S
Jacob, Rev. J.
Ware, W. T.

BEGONIAS.

MacLeod, J. F.
Chapman, A.
Heal, J., V.M.H.

SWEET PEAS.

Stevenson, Thomas
Jones, H. J.
Watkins, Alfred

HARDY HERBACEOUS PLANTS.

Groups in the Tent.

Lynch, R. Irwin, V.M.H.
Cuthbertson, W., V.M.H.
Crisp, Bernard

Exhibits on Tables.

Turner, T. W.
Fielder, C. R., V.M.H.
Pearson, A. H., V.M.H.

FLOWERING TREES AND SHRUBS.
In Tent.

Cheal, Joseph, V.M.H.
Beckett, E., V.M.H.
Harrow, George

FLOWERING PLANTS.
On Tables.

Veitch, P. C. M., J.P.
Notcutt, R. C.
Davis, J.

Hudson, J., V.M.H.
Paul, G., V.M.H.
Hales, W.

In Great Tent.

Morter, W.
Dixon, C.
Howe, W.
Blakey, W. J.

FOLIAGE PLANTS.

Bain, W.
Baker, W. G.
Hill, Arthur W., M.A.

FRUIT AND VEGETABLES.

Challis, T., V.M.H.
Poupart, W.
Rollit, Sir Albert K., LL.D.
Reynolds, G.

GROUPS IN THE OPEN AIR.
(Excluding Rock and Formal Gardens.)

Bilney, W. A., J.P.
Crump, W., V.M.H.
Knowles, P.O.

ROCK AND ALPINE GARDENS.
Outside and Inside.

Bowles, E. A., M.A.
Clutton Brock, A.
Grandfield, J.

"DAILY GRAPHIC" CUP.

Bowles, E. A., M.A.
Crisp, Sir Frank, Bt., F.L.S.
Parsons, Alfred, R.A.
Hanbury, Fred. J.

FORMAL GARDENS.

White, Edward
Tipping, H. Avery

HORTICULTURAL SUNDRIES.
To Stands of Exhibits.

Hooper, H.
Keeble, Dr. F. W., F.R.S.
Boscawen, Hon. John

To Individual Objects.

Chittenden, F. J., F.L.S.
Wilks, Rev. W., V.M.H.
White, Edward

PICTURES AND STATUARY.

Bowles, E. A., M.A.
Parsons, Alfred, R.A.
Wilks, Rev. W., M.A., V.M.H

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH THE JUDGES.

The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Fruit, Floral, and Orchid Committees will be found under their respective reports.

Orchids.

Gold Medal.

J. Gurney Fowler, Esq., Brackenhurst, Pembury, Kent (gr. J. Davis).

Messrs. Charlesworth, Haywards Heath.

Messrs. Sander, St. Albans.

Silver-gilt Cup.

Sir Jeremiah Colman, Bt., V.M.H., Gatton, Reigate (gr. J. Collier).

Messrs. Armstrong & Brown, Tunbridge Wells.

Messrs. Flory & Black, Slough.

Messrs. McBean, Cooksbridge, Sussex.

Large Silver Cup.

Messrs. Stuart Low, Enfield, Middlesex.

Silver Cup.

Messrs. Cypher, Cheltenham.

Standard Cup.

Messrs. Mansell & Hatcher, Rawdon, Leeds.

Silver Flora Medal.

Mr. H. Dixon, Wandsworth Common, S.W.

Lindley Medal.

Messrs. Armstrong & Brown, of Orchidhurst, Tunbridge Wells, for three specimens of *Coelogyne pandurata*, with spikes bearing fifteen or sixteen flowers.

The Davidson Silver Cup.

F. Menteith Ogilvie, Esq., Woodstock Road, Oxford, for *Cattleya Mendelii*, var. 'Queen Mary,' white with pink-tinged lip.

(Also entered in competition were var. 'King Albert,' from W. Bolton, Esq.; var. 'Princess Mary,' from Messrs. S. Low; and var. *virginalis*, from Mr. H. Dixon.)

Exhibits in the Open Air.

Gold Medal.

Messrs. Fromow, Chiswick, for Japanese maples.

Silver-gilt Cup.

Mr. L. R. Russell, Richmond, for flowering and ornamental shrubs.

Messrs. R. Wallace, Colchester, for rock garden.

Silver Cup.

Mr. Clarence Elliott, Stevenage, Herts, for rock garden.

Messrs. Kent & Brydon, Darlington, for rock garden.

Standard Cup.

Messrs. Waterer & Crisp, Bagshot, Surrey, for rock garden.

Messrs. Whitelegg & Page, Chislehurst, for rock garden.

"Daily Graphic" Cup.

Messrs. Wallace, Colchester, for rock garden.

Silver-gilt Flora Medal.

Messrs. Cutbush, Highgate, N., for clipped trees.

The Donard Nursery Co., Co. Down, Ireland, for flowering and ornamental shrubs.

Messrs. J. Piper, Bayswater, for Azaleas, flowering trees and shrubs, topiary, and Japanese trees.

Messrs. Waterer & Crisp, Bagshot, for trees and shrubs.

Mr. E. Dixon, Putney, for formal garden.

Messrs. J. Piper, Bayswater, for rock garden.

Mr. J. Wood, Boston Spa, for rock garden.

Messrs. Tucker, Oxford, for rock garden.

Silver-gilt Banksian Medal.

Messrs. Carter, Raynes Park, for Azaleas.

Mr. John Klinkert, Richmond, for clipped trees, &c.

Mr. Amos Perry, Enfield, Middlesex, for hardy Ferns.

The Guildford Hardy Plant Nursery, Guildford, for rock garden.

Messrs. Pulham, Newman Street, Oxford Street, for rock garden.

Silver Flora Medal.

Messrs. J. Cheal, Crawley, for trees, shrubs, and plants.

Miss Hopkins, Mere, Shepperton, for rock garden.

EXHIBITS IN THE GREAT TENT.

Gold Medal.

Messrs. Blackmore & Langdon, Bath, for Begonias.

Messrs. Ben Cant, Colchester, for Roses.

Messrs. Cuthbert, Southgate, for Azaleas.

Mr. C. Engelmann, Saffron Walden, for Carnations.

Messrs. H. B. May, Upper Edmonton, for flowering plants and Ferns.

Messrs. W. Paul, Waltham Cross, for Roses.

Messrs. Sutton, Reading, for flowering plants.

Silver-gilt Cup.

Messrs. Barr, Covent Garden, for Tulips.

Messrs. Carter, Raynes Park, for flowering plants.

Messrs. Cutbush, Highgate, for Roses.

Messrs. Jackman, Woking, for Clematis, shrubs, and herbaceous plants.

Messrs. Piper, Bayswater, for Roses, Wistarias, Tulips.

Mr. L. R. Russell, Richmond, for stove and greenhouse plants, Caladiums and Clematis.

Messrs. R. Wallace, Colchester, for Tulips.

Large Silver Cup.

Messrs. Bees, Liverpool, for rare alpines, Primulas, and Chinese plants.

Mr. Amos Perry, Enfield, Middlesex, for Lilies, Pæonies, herbaceous.

Messrs. Waterer & Crisp, Bagshot, Surrey, for Tulips.

Silver Cup.

Messrs. Frank Cant, Colchester, for Roses.

Messrs. Hobbies, Dereham, for Roses.

Standard Cup.

Messrs. Allwood, Haywards Heath, for Carnations.

Messrs. Blackmore & Langdon, Bath, for Delphiniums.

Mr. A. F. Dutton, Iver, for Carnations.

Messrs. Laxton, Bedford, for Pot Strawberries, Currants, and fruit trees in pots.

Mr. R. C. Notcutt, Woodbridge, for Rhododendrons, Azaleas, and Cytisus.

Mr. Charles Turner, Slough, for Azaleas, Lilacs, and Heliotropes.

Messrs. Waterer & Crisp, Bagshot, for Rhododendrons.

Silver-gilt Flora Medal.

Sir J. Horlick, Bt., West Dean Park, Chichester (gr. W. H. Smith), for *Richardia Pentlandii.*

Messrs. Artindale, Sheffield, for herbaceous and alpine plants.

Messrs. R. H. Bath, Wisbech, for Tulips.

Messrs. Bunyard, Maidstone, for herbaceous plants.

Messrs. Clark, Dover, for herbaceous and alpine plants.

Messrs. Cutbush, Highgate, N., for Carnations.

Messrs. Cutbush, Highgate, N., for herbaceous plants.

Messrs. G. Paul, Cheshunt, for Roses.

Messrs. Peed, West Norwood, for Caladiums and stove plants.

Messrs. Webb, Stourbridge, for flowering plants and Begonias.

Messrs. Wills & Segar, South Kensington, for flowering plants Palms, and Ferns.

Mr. G. Reuthe, Keston, Kent, for perennials and rare shrubs.

Silver-gilt Banksian Medal.

Misses Tate and Tanner, Caldecote Towers, Bushey Heath, for Calceolarias (gr. Mr. F. Streeter).

Messrs. Phillips & Taylor, Bracknell, for herbaceous plants.

Mr. George Prince, Longworth, Berks, for Roses.

Mr. Charles Turner, Slough, for Roses.

Silver Flora Medal.

Lady Paget, Warren House, Kingston Hill, for Calceolarias (gr. Mr. G. Figgis).

Messrs. Jefferies, Cirencester, for Tulips.

Messrs. Stuart Low, Enfield, Middlesex, for Roses.

Messrs. Stuart Low, Enfield, Middlesex, for Australian plants.
Mr. G. W. Miller, Wisbech, for herbaceous plants.
Messrs. Phillips & Taylor, Bracknell, for alpine and bog plants.
Messrs. Wallace, Colchester, for Eremuri, Gladioli, and Lilies.

Silver Banksian Medal.

Messrs. Bunyard, Maidstone, for Rhododendrons and Azaleas.
Messrs. Cutbush, Highgate, N., for flowering plants.
Mr. S. Mortimer, Slough, for Stocks.
Messrs. Whitelegg & Page Chislehurst, for Wistarias, Acers, and Schizanthus.

EXHIBITS ON TABLES.

Gold Medal.

Sir Everard Hambro, K.C.B., Hayes Place, Kent (gr. J. Grandfield), for hardy plants and alpines.
The Hon. Vicary Gibbs, Aldenham House, Elstree (gr. E. Beckett), for vegetables.
Messrs. Wm. Bull, Chelsea, for Amaryllis.
Messrs. Dickson, Newtownards, for Tulips.
Messrs. Dobbie, Edinburgh, for Sweet Peas.

Silver-gilt Cup.

The Hon. John Ward, C.V.O., Chilton, Hungerford (gr. C. Beckett), for collection of fruit.
Messrs. Barr, Covent Garden, W.C., for herbaceous plants.

Large Silver Cup.

Mr. Elisha J. Hicks, Twyford, Berks, for Roses.

Silver Cup.

Messrs. A. Dickson, Newtownards, for Sweet Peas.
Messrs. Dobbie, Edinburgh, for Tulips.
Messrs. Hogg & Robertson, Belfast, for Tulips.

Standard Cup.

Messrs. Bunyard, Maidstone, for dishes of fruit.
Mr. Maurice Prichard, Christchurch, for herbaceous plants.
Messrs. Sutton, Reading, for Tulips.

Silver-gilt Flora Medal.

Mrs. M. C. Hammond, The Close, Salisbury, for Pelargoniums.
Dr. John Macwatt, Morelands, Duns, N.B., for Primulas.
Mr. J. C. Allgrove, Langley, Slough, for herbaceous plants.
Messrs. Bakers, Wolverhampton, for alpine plants.
Messrs. Bakers, Wolverhampton, for herbaceous plants.
Messrs. Bide, Farnham, Surrey, for Sweet Peas.
Mr. H. Burnett, Guernsey, for Carnations.
Messrs. Frank Cant, Colchester, for Roses.
Mr. J. Douglas, Great Bookham, for Border Carnations and Auriculas.

Messrs. Hill, Upper Edmonton, for exotic Ferns.
Mr. Frank Lilley, Guernsey, for Gladioli and Irises.
Mr. Maurice Prichard, Christchurch, for alpine plants and Azaleas.
Mr. J. Stevenson, Wimborne, for Sweet Peas.
Messrs. R. Wallace, Colchester, for Irises.
Messrs. T. S. Ware, Feltham, for herbaceous plants.

Silver-gilt Banksian Medal.

Mr. E. J. Allard, "The John Innes Institution, Merton, for Hybridization of Calceolarias."
Messrs. G. and W. H. Burch, Peterborough, for Roses.
Mrs. Lloyd Edwards, Llangollen, for alpine plants.
Mr. H. Hemsley, Crawley, for alpine plants.
Mr. Vernon T. Hill, Langford, Bristol, for alpine plants.
Messrs. Stuart Low, Enfield, Middlesex, for Carnations.
Messrs. T. S. Ware, Feltham, for alpine plants.

Silver Knightian Medal.

Messrs. Sutton, Reading, for Melons.

Silver Flora Medal.

R. L. Mond, Esq., Coombe Bank, Sevenoaks, for Calceolarias.
The Hon. John Ward, C.V.O., Chilton, Hungerford (gr. C. Beckett), for Carnations.
Mr. R. J. Barnes, Malvern, for Roses.
Mr. J. Box, Lindfield, for herbaceous and alpine plants.
Messrs. Cannell, Swanley, for Roses, Pelargoniums, Primulas, &c.
Messrs. Godfrey, Exmouth, for Pelargoniums and Poppies.
Mr. J. MacDonald, Harpenden, for Lawn Grasses.
Messrs. Sydenham, Birmingham, for Sweet Peas.
Messrs. Thompson & Charman, Bushey, Hants, for Cistus and hardy plants.
Messrs. Young, Cheltenham, for Carnations.

Silver Banksian Medal.

Messrs. Carter Page, London Wall, for Dahlias and annuals.
Messrs. John Forbes, Hawick, for herbaceous, Violas, &c.
Messrs. B. Ladhams, Shirley, Southampton, for hardy flowers.
Messrs. Laxton, Bedford, for Carnations.
Messrs. G. Paul, Cheshunt, for cut Lilacs.
Messrs. Wells, Merstham, for Carnations and Antirrhinums.
Mr. Wells, Jun., Merstham, for alpine plants.

Bronze Flora Medal.

Messrs. Rich, Bath, for hardy flowers.
Mr. Vincent Slade, Taunton, for Pelargoniums.
Messrs. Reamsbottom, Geashill, King's Co., for St. Brigid Anemones.

Pictures.

Silver Flora Medal.

Mrs. E. Fisher, Westerham, East Molesey.

Silver Banksian Medal.

Miss Lamont, 2 Carlisle Place, S.W.
Miss F. M. Pilkington, 17 Pembridge Gardens, W.
Mrs. M. Townsend, 79 Yale Court, W. Hampstead.
Miss F. Warrington, 48 Buckleigh Road, Streatham Common, S.W.

Garden Plans.

Silver Banksian Medal.

Messrs. Milner & White, 7 Victoria Street, S.W.
Messrs. R. Wallace, Colchester.

Horticultural Sundries.

Outside.

Standard Cup.

Messrs. Liberty, Regent Street, W., for Japanese stone lanterns.

Silver-gilt Flora Medal.

Messrs. Cashmore, 96 Victoria Street, S.W., for statuary and ironwork

Messrs. Crowther, 282 North End Road, Fulham, for old garden ornaments, figures, &c.

Silver Flora Medal.

The En Tout Cas Co., Syston, for garden furniture &c.

Silver-gilt Banksian Medal.

Messrs. Gamage, Holborn, for garden furniture, tools, &c.

Messrs. Purser, Hatton Garden, E.C., for spraying apparatus.

Mr. Arthur Roberts, West Derby, for patent heating and ventilating appliances.

Silver Banksian Medal.

Mr. J. West Carnie, Bryanston Street, S.W., for flower glasses, garden seats, &c.

Castle's Shipbreaking Co., Millbank, S.W., for garden furniture.

Messrs. Crookshanks & MacSelf, Fulwood Place, S.W., for spraying machines, pottery, &c.

Messrs. Drew, Clark, Leyton, for telescopic ladders.

Messrs. Hartjen, Noble Street, E.C., for spraying machines.

Messrs. Maggs, Bristol, for teak garden seats, chairs, tents, &c.

Mr. J. Pinches, Camberwell, S.E., for labels, trainers, and exhibition boxes.

The United Brassfounders and Engineers, Ltd., Birmingham, for spraying machines.

Bronze Banksian Medal.

The Acme Ladder Co., Earlsfield, for ladders, steps, and barrows.

The Acme Chemical Co., Tonbridge, for weed-killers &c.

Messrs. Crispin, Bristol, for boilers, greenhouses, &c.

The Folding Span Light Co., Slough, for span lights and frames.

The Gripper Manufacturing Co., Leicester, for garden walking-sticks, scrapers, &c.

The Leyton Timber Co., Sutton, Surrey, for rustic garden furniture.

Messrs. Pearce, Holloway Road, N., for greenhouses and summer-houses.

Messrs. Philcox, Acre Lane, Brixton, S.W., for ladders, trellis, &c.

Messrs. Skinner Board, Bristol, for greenhouses and flower sketches.

Messrs. H. C. Slingsby, Old Street, E.C., for ladders and barrows.

Messrs. T. Syer, Finsbury, E.C., for garden furniture.

In Tent.

Silver Banksian Medal.

Messrs. Abbott, Southall, for the Osterley table tray, &c.

Messrs. Pattisson, Streatham, for horse boots.

Messrs. Voss, Millwall, for insecticides and fertilizers.

Messrs. Weeks, 72 Victoria Street, S.W., for glass-houses and heating apparatus.

Messrs. E. A. White, Paddock Wood, for insecticides, syringes, &c.

Mrs. S. Miller, Marlow, for preserves.

Mr. Percy Bunyard, 57 Kidderminster Road, Croydon, for horticultural sundries.

Bronze Flora Medal.

Glynde College, Sussex, for flowers and produce and plans of gardens.

Bronze Banksian Medal.

The Boundary Chemical Co., Liverpool, for lawn sand and weed-killers.

Messrs. Cooper & Nephews, Berkhamsted, for insecticides, pumps, &c.

Garden City Trug Co., Fleet, for trugs and garden tools.

Mr. J. Haws, Lower Clapton Road, N.E., for watering-cans.

Messrs. Jeyes, Cannon Street, E.C., for insecticides and sprayers.

Price's Patent Candle Co., Battersea, for insecticides.

Messrs. Prentice, Stowmarket, for fertilizers.

Sanitas Co., Limehouse, E., for disinfectants.

Sewell, Miss H. G., 67 Harcourt Terrace, S.W., for preserves.

Messrs. Truslove & Hanson, 6b Sloane Street, S.W., for gardening books.

GENERAL MEETING.

JUNE 5, 1915.

Sir DANIEL MORRIS, K.C.M.G., D.Sc., in the Chair.

Fellows elected (76).—F. T. Adams, Mrs. J. F. Albright, A. Andrews, Miss L. Arbuthnot, Mrs. Baring, Miss Baxter, Mrs. Beecheno, Miss F. E. Biddlecombe, Miss E. Blay-King, Dr. F. Bryan, J. L. Burt, Mrs. E. D. Caird, Mrs. R. Copland-Sparkes, Mrs. E. B. Costin, G. Croll, Mrs. C. Davison, Miss E. de Jongh, Mrs. de Jongh, H. Dickson, Capt. T. Donnelly, Mrs. Eeles, H. G. M. Evans, Mrs. E. G. Fellows, J. Finnegan, Mrs. E. Fitz-Gerald, J. F. Ford, W. Francis, Miss G. E. Galbraith, Mrs. F. Gaskell, Miss Goldney, Mrs. P. Gosse, Mrs. Hamilton, Miss Henderson, Mrs. Izod, E. Jaques, Mrs. N. Johnson, G. Kerswill, G. W. Kilner, Mrs. J. King, Mrs. Kinsey-Taylor, G. T. Langridge, F. D. Last, Mrs. N. Macpherson, Miss S. M. Martineau, Mrs. Mathews, Mrs. J. Minchin, C. Murfey, Mrs. F. Muir, Lady Nathan, C. F. Partington, J.P., T. Pitts, C.B., A. Portsmouth, Mrs. B. Richmond, Mrs. Ronaldson, Mrs. H. Roper, T. Russell, A. D. Saunderson, L. A. Scott-Elliot, W. Shakspeare, H. W. Sheard, H. P. Smallpeice, H. W. D. Soper, J. Tearoe, A. Thomson, H. A. Tipping, A. D. Tisdall, Mrs. H. Trench, Hon. V. Vivian, J. W. Way, Major W. H. Webb, C. Webb, J. H. Welsford, W. J. H. Whittall, Hon. Mrs. Godfrey Williams, J. H. Wise, C. A. Woodhouse.

Fellows resident abroad (3).—J. K. Bhattacharyya (Bengal), Harry W. Poore (Argentina), M. K. Venkata Rau, F.L.S. (Mysore).

Associates (2).—Miss K. Bayliss, A. Ireland.

The Thirteenth Masters Memorial Lecture on "Recent Investigations on the Production of Plant Food in the Soil," was given by Dr. E. J. Russell, D.Sc. (see p. 173).

GENERAL MEETING.

JUNE 22, 1915.

Sir JOHN T. D. LLEWELYN, Bart., in the Chair.

Fellows elected (48).—Mrs. Alcock, Alderman L. Allen, Mrs. Keith Arbuthnot, Mrs. E. Bannister, Lady Barnes, Mrs. W. Blackett, F. Bromwich, C. Bruce, Mrs. Bethune Chapman, H. J. Cooper, Alfred Corah, John A. Corah, Mrs. J. A. Corah, S. Cowper-Coles, Mrs. H. G. Cubitt, A. Davey, Mrs. M. Edwin, Hon. Lady Farquhar, Lady Fermor Hesketh, V. de Courcy Hughes, Mrs. Huntington, Mrs. E. M. Inglis, Mrs. E. A. Johnson, Mrs. C. Wynne Jones, Mrs. E. Dunbar Kilburn, T. P. Latham, Mrs. E. E. Lloyd, Miss L. Lovegrove, Miss M. A. McIntosh, Mrs. Madeley, H. H. Mason, A. J. Mathews, Mrs. C. D. Miller, Mrs. T. H. Miller, G. F. Ormes, Mrs. Poole, W. H. Prentice, D. L. Rees, A.C.P., Mrs. Reid, L. G. Richards, J. Robin, Mrs. J. C.

Shorrock, Mrs. Vernon, Mrs. P. Walters, Mrs. C. Wheatley, W. D. Wiltshire, Rev. H. H. Winwood, H. Woodman.

Fellows resident abroad (3).—H. G. Alford (Johannesburg), H. M. Eddie (British Columbia), S. M. Nasir (India).

Associates (3).—Miss R. E Carpenter, Miss M. Philip, Miss N. Ross.

The Fourteenth Masters Memorial Lecture, on "Recent Investigations on the Production of Plant Food in the Soil," was given by Dr. E. J. Russell, D.Sc. (see p. 188).

HOLLAND PARK SHOW.

JULY 6, 7, 8, 1915.

LIST OF JUDGES.

ORCHIDS.

(*Nurserymen's Exhibits.*)

Fowler, J. Gurney
Shill, J. E.
Alexander, H. G.

(*Amateurs' Exhibits.*)

Bolton, W.
Cypher, J., V.M.H.
Sander, F., V.M.H.

ROSES.

Page Roberts, Rev. F.
Piper, T. W.
Mease, W.

CARNATIONS.

Turner, A.
Jennings, J.
MacLeod, J. F.

TUBEROUS BEGONIAS.

Blick, C.
Chapman, A.
Heal, J., V.M.H.

SWEET PEAS.

Curtis, C. H.
Bates, W.
Watkins, A.

FRUIT AND VEGETABLES.

Challis, T., V.M.H.
Poupart, W.
Reynolds, G.
Harris, E.

HERBACEOUS PLANTS.

Gibbs, Hon. Vicary
Shea, C. E.
Paul, G., V.M.H.

Notcutt, R. C.
Beckett, E., V.M.H.
Hales, W.

ALPINES, ROCK AND WATER GARDENS.

Bilney, W. A., J.P.
Bowles, E. A., M.A., F.L.S.
Bedford, A.
Divers, W. H., V.M.H.

FOLIAGE PLANTS.

Bain, W.
Wythes, G., V.M.H.
Tivey, G. T

FLOWERING PLANTS.

Page, W. H.
Morter, W. H.
Howe, W.

Baker, W. G.
Davis, J.
Turner, T. W.

GROUPS IN OPEN AIR.

Pearson, C.
Cheal, J., V.M.H.
Dixon, C.

FLOWERING TREES AND SHRUBS.

Thomas, Owen, V.M.H.
Harrow, G.
Blakey, W. J.

SHERWOOD AND WIGAN CUPS.

Wigan, A. L.
Pearson, A. H., V.M.H.
Green, J.

AFFILIATED SOCIETIES' CUP AND GORDON-LENNOX CUP.

Cheal, J., V.M.H.
Crisp, Bernard
Hudson, J., V.M.H.

CLAY CHALLENGE CUP.

Jefferies, W. J.
Orpen, O. G.
Maud, Miss

SUNDRIES.

Keeble, Dr. Fred. W., F.R.S.
Chittenden, F. J., F.L.S.
Pearson, C.

PICTURES AND STATUARY.

Bowles, E. A., M.A., F.L.S.
Wilks, Rev. W., M.A., V.M.H.

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH THE JUDGES.

The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Floral and Orchid Committees will be found in their respective reports.

The Coronation Cup for the most meritorious exhibit in the Show.

Messrs. Blackmore & Langdon, Twerton Hill, Bath, for Begonias.

The Wigan Cup (for Roses).

Mr. Elisha J. Hicks, Twyford.

The Clay Challenge Cup (for a Rose not in commerce, possessing the true old Rose scent).

Messrs. Ben R. Cant, The Old Rose Gardens, Colchester, for Rose 'Colcestria.'

Gold Medal.

Sir Jeremiah Colman, Bt., Gatton Park, Surrey (gr. Mr. J. Collier), for Orchids.

The Right Hon. Lord North, Wroxton Abbey, Banbury (gr. E. R. Janes), for Sweet Peas.

Messrs. Blackmore & Langdon, Bath, for Begonias.

Messrs. Ben R. Cant, Colchester, for Roses.

Messrs. A. Dickson, Newtownards, for Sweet Peas.

Messrs. Dobbie, Edinburgh, for Sweet Peas.

Messrs. A. F. Dutton, Iver, Bucks, for Carnations.

Mr. Elisha J. Hicks, Twyford, for Roses.
Messrs. Mansell & Hatcher, Rawdon, Leeds, for Orchids.
Messrs. W. Paul, Waltham Cross, for Roses.
Messrs. Wallace, Colchester, for herbaceous plants.
Messrs. Wallace, Colchester, for Eremuri.

Silver-gilt Cup.

Messrs. Sander, St. Albans, for Orchids.

Large Silver Cup.

Major Waldorf Astor, M.P., Clivedon, Taplow (gr. W. Camm), for Grapes and Nectarines.
Messrs. S. Bide, Farnham, for Sweet Peas.
Messrs. Flory & Black, Slough, for Orchids.
Messrs. Fromow, Chiswick, for Japanese Maples.
Messrs. J. Hill, Edmonton, for Ferns.
Messrs. H. B. May, Upper Edmonton, for Ferns.
Mr. C. Turner, Slough, for Roses.
Messrs. Wallace, Coichester, for water garden.

Silver Cup.

Messrs. Charlesworth, Haywards Heath, for Orchids.
Messrs. Paul, Cheshunt, for Roses.

Standard Cup.

Messrs. Armstrong & Brown, Tunbridge Wells, for Orchids.
Mr. H. J. Jones, Lewisham, for Phlox and Canterbury Bells.
Messrs. E. W. King, Coggeshall, for Sweet Peas.
Mr. L. R. Russell, Richmond, for Ivies and shrubs.
Messrs. Stuart Low, Bush Hill Park, Enfield, for Roses.
Messrs. Stuart Low, Bush Hill Park, Enfield, for Orchids.

Silver Lindley Medal.

J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. J. Davis), for Odontoglossum 'Georgius Rex.'

Silver-gilt Flora Medal.

Lieut.-Colonel The Right Hon. Mark Lockwood, Romford (gr. G. Cradduck), for Fuchsias.
Messrs. Brown, Stamford, for Roses.
Mr. H. Burnett, Guernsey, for Carnations.
Messrs. F. Cant, Colchester, for Roses.
Messrs. W. Cutbush, Highgate, N., for clipped trees.
Messrs. A. Dickson, Newtownards, for Roses.
The Donard Nursery Co., Newcastle, co. Down, for flowering and ornamental shrubs.
Messrs. Harkness, Bedale, Yorks., for hardy herbaceous plants.
Messrs. Hobbies, Dereham, for Sweet Peas.
Messrs. J. K. King, Coggeshall, for Sweet Peas.
Messrs. McBean, Cooksbridge, for Orchids.

Messrs. Stuart Low, Bush Hill Park, for Carnations.
Messrs. Paul, Cheshunt, for flowering shrubs.
Messrs. J. Peed, West Norwood, for Caladiums.
Mr. Amos Perry, Enfield, for Ferns.
Mr. Amos Perry, Enfield, for herbaceous plants.
Mr. Maurice Prichard, Christchurch, for herbaceous plants
Mr. George Prince, Oxford, for Roses.
Mr. G. Reuthe, Keston, for herbaceous plants and shrubs.
Mr. L. R. Russell, Richmond, for stove plants.
Mr. J. Stevenson, Poole Road, Wimborne, for Sweet Peas.
Messrs. Thompson & Charman, Bushey, Herts, for herbaceous plants.
Messrs. T. S. Ware, Feltham, for Begonias.

Silver-gilt Knightian Medal.

Messrs. Barr, Covent Garden, for vegetables.

Silver-gilt Banksian Medal.

Mary, Countess of Ilchester, Holland House (gr. C. Dixon), for Sempervivums, Saxifrages, &c.
Mr. J. C. Allgrove, Langley, Slough, for Eremuri and herbaceous plants.
Messrs. Bunyard, Maidstone, for herbaceous plants.
Messrs. J. Cheal, Crawley, for trees and shrubs.
Messrs. Cuthbert, Southgate, for flowering plants.
Messrs. Hugh Dickson, Belfast, for Roses.
Mr. James Douglas, Great Bookham, for border Carnations.
Messrs. Jackman, Woking, for Roses.
Messrs. Kelway, Langport, for Delphiniums and hardy plants.
Messrs. B. Ladhams, Southampton, for hardy plants.
Messrs. Laxton, Bedford, for Strawberries.
Mr. S. Mortimer, Farnham, for Melons, Tomatos, and Cucumbers.
Messrs. J. Piper, Bayswater, for rock and water garden.
Messrs. Ware, Feltham, for alpine and herbaceous plants.
Messrs. Waterer & Crisp, Bagshot, for alpine and herbaceous plants and Water Lilies.

Silver Flora Medal.

Messrs. Bees, Chester, for new Chinese plants.
Messrs. Bees, Chester, for Delphiniums and herbaceous.
Mr. J. Box, Haywards Heath, for Sweet Peas.
Messrs. Bunyard, Maidstone, for Roses.
Messrs. G. & W. H. Burch, Peterborough, for Roses.
Mr. H. Dixon, Wandsworth, for Orchids.
Messrs. Hobbies, Dereham, for Roses.
Messrs. Jackman, Woking, for herbaceous plants.
Messrs. Jarman, Chard, for Sweet Peas.
Mr. J. Macdonald, Harpenden, for grasses.
Mr. G. W. Miller, Wisbech, for Delphiniums and herbaceous plants.

Mr. G. Reuthe, Keston, for shrubs.

Messrs. Robert Sydenham, Birmingham, for Sweet Peas.

The Yokohama Nursery Co., Craven House, Kingsway, for Japanese trees and miniature gardens.

Messrs. Young, Cheltenham, for Carnations.

Silver Knightian Medal.

Sir Daniel Gooch, Bt., Hylands, Chelmsford (gr. W. Heath), for vegetables.

Silver Banksian Medal.

Messrs. Barr, Covent Garden, for Japanese trees.

Messrs. G. A. Clark, Dover, for herbaceous plants.

Messrs. W. Cutbush, Highgate, for Carnations, herbaceous and greenhouse plants.

Mr. Clarence Elliott, Stevenage, for alpine plants.

Messrs. Godfrey, Exmouth, for Campanulas, Pelargoniums, and herbaceous plants.

The Guildford Hardy Plant Nurseries, for herbaceous plants.

Mr. H. Lakeman, Thornton Heath, for Carnations.

Messrs. Laxton, Bedford, for Carnations.

Mr. R. C. Notcutt, Woodbridge, for Roses.

Messrs. J. Peed, West Norwood, for Streptocarpus and Gloxinias.

Rev. J. H. Pemberton, Havering-atte-Bower, for Roses.

Mr. G. Reuthe, Keston, for rock plants.

Messrs. Stuart Low, Bush Hill Park, for flowering plants.

Mr. C. F. Waters, Balcombe, for Orchids.

Mr. W. Wells, junr., Merstham, for herbaceous plants.

Messrs. Whitelegg & Page, Chislehurst, for herbaceous plants.

Bronze Knightian Medal.

Messrs. Whitelegg & Page, Chislehurst, for New-berry.

Bronze Flora Medal.

Messrs. Artindale, Sheffield, for Violas.

Messrs. Bakers, Wolverhampton, for hardy plants.

Messrs. Barr, Covent Garden, for herbaceous plants.

Messrs. Blackmore & Langdon, Bath, for Delphiniums.

Messrs. J. Cheal, Crawley, for trees, shrubs, and herbaceous plants.

Messrs. H. Cutbush, Highgate, for Roses.

Mr. Frank Lilley, Guernsey, for Gladioli and Irises.

Messrs. Carter Page, London Wall, for Dahlias and Violas.

Messrs. J. Piper, Bayswater, for clipped trees.

Mr. G. Stark, Great Ryburgh, for Sweet Peas.

Mr. Chas. Turner, Slough, for Carnations.

Horticultural Sundries.

Silver Banksian Medal.

Messrs. Abbott, Southall, for table trays.

Messrs. Barr, Covent Garden, for cloches, frames, &c.

Castle's Shipbreaking Co., for teakwood garden furniture.

Four Oaks Spraying Machine Co., for spraying machines, pumps, &c.

Messrs. Hughes, Bolckow, 10 Dover Street, W., for teakwood garden furniture.

Messrs. Liberty, Regent Street, W., for Japanese and English pottery.

Leyton Timber Co., Haddon Road, Sutton, Surrey, for rustic garden furniture.

Messrs. Maggs, Bristol, for garden seats, tables, &c.

Mrs. S. Miller, Moyleen, Marlow, for confections.

Mr. H. Pattisson, Streatham, for horse boots.

Mr. H. C. Slingsby, Old Street, E.C., for patent ladders and steps.

Messrs. E. A. White, Paddock Wood, for insecticides, sprays, &c.

Bronze Banksian Medal.

Mr. Percy Bunyard, 57 Kidderminster Road, Croydon, for fumigating compounds.

Messrs. J. Crispin, Bristol, for greenhouses, boilers, and frames.

Garden City Trug Co., Fleet, for trugs.

Messrs. H. C. Philcox, Brixton, for ladders, steps, and barrows.

Messrs. Truslove & Hanson, 6b Sloane Street, for gardening books.

WATER-COLOUR PAINTINGS OF FLORAL SUBJECTS.

Silver-gilt Banksian Medal.

Mrs. E. M. Fraser, Onslow Hotel, Queen's Gate, S.W.

Silver Banksian Medal.

Miss H. M. Bulkley, 8 Holland Villas Road, W.

Bronze Banksian Medal.

Mrs. E. Heisch, Cheyne Cottage, Stanmore.

Miss E. Lamont, 2 Carlisle Place, S.W.

Miss M. Linnell, 197 Adelaide Road, N.W.

Mrs. S. Miller, Moyleen, Marlow.

Miss F. M. Pilkington, 17 Pembridge Gardens, W.

Miss F. Randolph, 8 Carmalt Gardens, Putney, S.W.

Miss E. Warrington, 48 Buckleigh Road, Streatham Common.

STATUARY AND GARDEN ORNAMENTS.

Silver-gilt Banksian Medal.

Messrs. T. Crowther, 282 North End Road, Fulham.

Bronze Banksian Medal.

Mr. H. Jones, Horsecombe Quarries, Bath.

GENERAL MEETING.

July 20, 1915.

Mr. E. A. Bowles, M.A., F.L.S., in the Chair.

Fellows elected (81).—J. B. Anderson, W. Ark, J.P., Miss V. H. Baker, R. A. Barnes, W. G. Barnham, Mrs. F. W. Bellamy, Miss H. Blundell, Mrs. A. Bond, Mrs. Brodie, Mrs. Calderon, J. H. Collins, T. Copithorne, R. G. Currie, G. E. Davis, M. Deacon, Miss de Cardonnel-Lawson, H. L. Dennys, Capt. A. Desborough, A. Drury, C. L. Edwards, C. C. Eley, Mrs. H. D. Foster, J. C. E. Fruer, Miss M. A. Gillam, Mrs. G. S. Gillott, Miss A. A. Henderson, H. B. Henley, Miss R. Hevey, W. S. Higgins, F. C. Hill, Miss E. Hooper, Sir Henry H. Howorth, K.C.I.E., W. Husbands, Mrs. W. Johnson, F. G. Kendall, A. Kidd, Dr. J. Kirkland, A. L. Lang, W. J. S. Leonard, A.C.P., L. Levy, Lady Lewis, T. A. Lowe, Mrs. G. G. Macleod, P. Marsh, H. J. Marshall, J. F. Marshall, A. Maxwell, F. A. Maythorn, Miss E. Mitchell, S. Moon, J. A. Morrell, Mrs. P. Nugent, E. P. Pannell, B. C. Pearce, Miss R. A. Pearson, Mrs. L. K. Pearson, Mrs. Pell, E. A. Prosser, Mrs. R. Ray, Mrs. J. W. Ritchie, N. Roden, H. H. Rothery, S. H. Rugg, O. Russell, Viscountess St. Cyres, E. H. Severn, Mrs. H. A. Stewart, W. J. H. Sweatman, F. E. Tate, R. L. P. Tate, F. S. Taylor, W. J. Tennant, W. E. Thomas, E. J. Trowbridge, J. van Beek, B. Vernon, N. N. Wadia, B. Walker, J. J. W. Wall, G. West, Mrs. J. C. M. Wilson.

Fellow resident abroad (1).—E. Ahier (Jersey).

Societies affiliated (2).—Fulham Hort. Soc., Sheen Hall Hort. Soc.

A lecture on "The Alpine Plants of Yunnan" was given by Mr. George Forrest. (See p. 200.)

GENERAL MEETING.

August 4, 1915.

Mr. Joseph Cheal, V.M.H., in the Chair.

Fellows elected (12).—Miss E. Bolton, M.D., B.S., T. W. Edwards, R. R. Forster, N. Lane-Jackson, Capt. C. B. St. John Mildmay, Miss B. F. Parsons, Dr. L. Potts, Miss C. C. Robertson, A. Somerset, D. Swain, E. F. Yorke, E. J. C. Young.

Fellow resident abroad (1).—C. Bailey (Canada).

A lecture on "The Clematis—its development and cultivation" was given by Mr. A. G. Jackman, F.R.H.S. (See p. 209.)

GENERAL MEETING.

August 17, 1915.

Mr. Joseph Cheal, V.M.H., in the Chair.

Fellows elected (7).—J. C. Allgrove, D. W. Clarke, H. H. Lambert, W. Richards, F. C. Snowdon, W. D. Vizard, Conway Wertheimer.

Fellows resident abroad (2).—Vincent J. Esch (Calcutta), S. A. Hyder Faridie (Budaun, India).

A lecture on " The Mustard Beetle " was given by Mr. Frederick Enock, F.E.S.

GENERAL MEETING.

AUGUST 31, 1915.

Dr. FREDERICK KEEBLE, F.R.S., in the Chair.

Fellows elected (7).—E. J. Berner, C. S. Collingwood, Mrs. Holbech, G. H. McGready, Mrs. McLennan, Mrs. Vaughan-Williams, Mrs. Vlasto.

A lecture on " The respective Values of Organic and Inorganic Manures " was given by Mr. F. E P. Hodsoll, F.C.S. (See p. 217.)

SCIENTIFIC COMMITTEE.

MAY 11, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with twelve members present, and Mr. A. B. Lister, visitor.

Magnesium in Soil.—Dr. J. A. Voelcker referred to a sample of soil recently sent to him from near Cardiff, with the complaint that it had become infertile, although manured in the ordinary way. It was found to contain all the essential chemical elements in sufficient quantities to suggest that it was a fertile soil, but further analysis showed the presence of ·80 per cent. of magnesia and only ·36 per cent. of lime. Dr. Voelcker said that the excess of magnesia over lime was, no doubt, the cause of the soil's infertility, for experimental work at Woburn and elsewhere had clearly shown that when such excess existed the cropping power of the soil was greatly reduced.

Peat and Potash.—Dr. Voelcker also pointed out that peat varied greatly in composition, and that the materials sold under this name were often very dissimilar from one another. Burnt peat had recently been advocated as a source of potash for manuring, but all samples of burnt peat could not be relied upon to provide any considerable quantity of this necessary chemical, and as an example he mentioned a sample he had recently analysed which gave only ·58 per cent. of potash in the ash.

Apple with pistillate flowers.—Mr. E. A. Bunyard, F.L.S., exhibited a specimen of apple with pistillate flowers only. The flowers rarely, if ever, produce petals. An apple of this character is figured by Duhamel under the name of Fig Apple, and the tree in question bears fruits very similar in shape to the figure given in Duhamel's work. It is possibly the form mentioned in Darwin's works as the 'St. Valery' Apple.

Breaking of Tulips.—Canon Fowler remarked upon the great extent to which Tulips are breaking this season, and other members corroborated his observations. Breaking is very noticeable in the great collection at Wisley, and is by some thought to be due to a change of soil and by others to conditions brought about by a previous dry season.

Primula × 'Mrs. W. R. Lysaght.'—Mrs. W. R. Lysaght exhibited a very pretty Primula under the name of the exhibitor, raised by crossing *P. pulverulenta* 'Mrs. R. V. Berkeley' with *P.* × 'Unique.' It was raised at Castleford, Chepstow.

Lonicera Griffithii.—Lt.-Col. F. G. L. Mainwaring sent sprays of a very beautiful Honeysuckle which he had raised from seed sent from Chitral in 1910, flowering with him at Upwey, Dorset, in a greenhouse. He had had many failures with the plant, but after trying several

times to grow it from seeds and from cuttings he had at last succeeded. On the motion of Mr. R. Hooper Pearson, seconded by Mr. W. Hales, a Botanical Certificate was unanimously recommended to the plant.

Fasciated Polyanthus.—Mrs. J. R. Randolph sent a remarkable example of fasciated Polyanthus, the flower-stem of which measured over an inch in diameter.

Lysichitum camtschatcense.—Lady Turner sent from Haslemere flowering specimens of this fine herbaceous plant growing unprotected outdoors and flowering well. This plant is rarely seen, but is one of the finest of the hardy Aroids (fig. 91).

SCIENTIFIC COMMITTEE, JUNE 8, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with sixteen members present.

Uncommon Plants.—Mr. J. Spencer Evans, of Newbury, sent a plant identified by Dr. Rendle as *Erigeron uniflorus*, raised from seed from Tierra del Fuego. The plant is of wide distribution in Arctic regions. Mr. T. Hay, superintendent of Greenwich Park, sent *Phacelia concinna* raised from seed from Punta Arenas, Patagonia. Lady Lawrence sent the interesting and beautiful *Conanthera campanulata*, a plant introduced long ago, but rarely seen in gardens. It is a native of Chile, growing in grassy places near the snow-line. A Botanical Certificate was unanimously recommended to the last-named plant.

Flowering Time in Different Latitudes.—Mr. J. Fraser, F.L.S., showed specimens of *Salix nigricans* and the hybrid *S. arbuscula* × *herbacea* from his own garden and from their Scotch habitat, to illustrate the enormous difference in growth in the two localities (the foliage produced in the former being far larger than in the latter), and the difference in time of flowering, both forms flowering about two months earlier in the southern than in the northern habitat, which was at an elevation of about 2,100 feet.

Apple Fruit Spot.—Dr. A. S. Horne exhibited shrivelled mummified apples, which in October had shown numerous small brown spots extending just beneath the skin and generally slightly depressed, but no definite fungus growth. They now bore numerous pycnidia of *Cylindrosporium Pomi*, a fungus described by C. Brooks (*Bull. Torr. Bot. Club*, 35, 1908, p. 423), as the cause of a serious fruit spot of apples in the United States, but not previously recorded definitely for this country, though its presence has been suspected from the symptoms produced.

Apple Shoots Dying.—Mr. E. M. Holmes, F.L.S., showed shoots of Apple with canker-like spots, and with the newly-formed growths dying back, which Mr. G. Massee recognized as due to the attack of the fungus *Sclerotinia fructigena.*

Aliens.—Mr. Holmes also showed specimens of *Sideritis lanata*,

Anchusa hybrida, and *Roemeria hybrida* from a gravel-pit near Hoddesdon. The seed had probably come from food supplied to poultry.

Fasciation.—Mr. G. Wilson, F.L.S., showed a fasciated Rocket with many flowers, and a very broad corrugated stem. Mr. W. G. Smith sent specimens of a fasciated *Cotoneaster* from a plant growing in his garden at Dunstable on a wall facing south.

The late Sir A. H. Church.—The Committee learned with regret of the death of Sir A. H. Church, F.R.S., who had been a member of the Committee for many years. A vote of condolence with Lady Church in her bereavement was adopted.

Scientific Committee, June 22, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with fourteen members present, and Mr. W. R. Dykes, visitor.

The late Dr. Hugo Müller.—The Chairman expressed the deep regret the Committee felt at the death of Dr. Hugo Müller, F.R.S., who was for so long a member of the Scientific Committee, and whose kindly courtesy and ready assistance had been of the utmost value. The Secretary was instructed to convey the sympathy of the Committee to Mrs. Müller in her bereavement.

Culinary Mints.—Mr. A. Worsley showed a specimen of *Mentha viridis* var. α (Smith) which had previously been before the Committee, and some discussion took place upon the relative values of the various Mints for culinary purposes. It was resolved to collect together as many forms as possible for comparison.

Fasciation &c.—Mr. J. Fraser, F.L.S., showed a fasciated Polyanthus with a stem about 1 inch in diameter, and a Rose with branching buds in the centre.

White Meconopsis Wallichii.—Sir John T. D. Llewelyn showed flowers of a perfectly white-flowered seedling of *Meconopsis Wallichii*. This plant is variable in the shade of blue of its flowers, but white varieties appear to be very uncommon.

Angraecum armeniacum ?—Mr. J. Hudson, V.M.H., sent a plant which he had been growing for about twelve years, from the Chiswick collection, which had now flowered, and proved to be either *Angraecum armeniacum* or a close ally. It has axillary spikes, about 2½ inches in length, of concolorous apricot-yellow flowers. The plant was sent to Wisley.

Sporting in Orchid.—Mr. G. Wilson, F.L.S., showed on behalf of Mr. R. G. Thwaites flowers from two spikes of *Laelio-Cattleya* × *Canhamiana* var. 'Lady Wigan.' The plant was divided while the flowers were in the bud state, and, while one portion had produced normal flowers, the other had flowers showing considerable suffusion of purple on all the segments. There was nothing to show whether the variation had arisen before or after division of the plant.

Gummosis in Cherry.—Prof. G. S. Boulger, F.L.S., showed a branch

of Cherry which had been attacked by 'gummosis,' probably the result of invasion by a bacillus, through a wound where the disease had evidently started.

Echeveria setosa.—Mr. W. E. Ledger showed a flowering plant of this rare Mexican species, which produces large rosettes of setose leaves and very bright flowers on stems about 9 or 10 inches in height. It was recently described and figured by J. N. Rose and J. A. Purpus in "Contributions from the U.S. Nat. Herbarium" xiii. (1910), p. 45, t. 10. A Botanical Certificate was unanimously recommended for this plant.

Iris filifolia.—Mr. W. R. Dykes, M.A., showed flowers of the rare (true) *Iris filifolia.* It differs from the plant in common cultivation under that name (which is a form of *Iris Xiphium*) in having a distinct perianth tube. It has beautiful purple flowers, with a broad yellow, blue-edged band down the middle of the outer segments.

Castilleja miniata.—Mrs. Longstaff, of Wimbledon, showed a good and well-flowered spike of *Castilleja miniata,* which was now flowering in her garden for the third time, from seed collected in British Columbia. She believed it to be parasitic, in her garden upon a species of *Saponaria.*

Floral Malformations.—Mr. E. Mann, of Charters Towers, Queensland, sent some further floral malformations from his well-manured garden, which had passed through a dry season with a high temperature (100° shade). There were well-marked examples of "hen and chickens" Zinnias and a proliferous *Gomphrena.* He had previously sent proliferous and virescent examples of several other plants (see p. xliii).

Double Apple flowers.—Mr. H. M. Eddie, of Kerrisdale, British Columbia, wrote concerning some flowers on young Apple having double flowers of remarkable size, being 3 inches in diameter, and with twenty-eight to thirty petals each. It will be interesting to see whether the doubling is maintained as the plants become older, for it is no unusual thing for young Apple trees to produce double flowers but as the trees get older to produce only single ones.

Scientific Committee, July 20, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with eight members present, and Mr. G. Forrest, visitor.

Galls on Poplars.—Mr. J. Fraser, F.L.S., showed specimens of galls on the midribs and petioles of Black and Lombardy Poplars, and further specimens came from Mr. Fielder. They are due to the attack of the aphis known as *Pemphigus bursarius.*

Curious Growth of Potato Tubers.—Mr. R. Hooper Pearson showed Potato tubers received from a correspondent of the "Gardeners' Chronicle." These had produced young tubers apparently inside the older ones, but in reality attached outside, and arising as usual from a branch from the shoot derived from an eye. The eye was

rather deep-seated and the young tuber had apparently been wedged against the "eyebrow," and by its lateral expansion, and owing to the pressure of other tubers above, had split the parent tuber, having probably entered it at a spot where there was some defect in the old tuber. Its further development had been within the cleft so formed. It should be understood that the old tuber had produced the new tubers in dry store.

Garden Mints.—A large number of specimens of Mint were brought by members of the Committee from various districts, and one was sent by Mr. Fletcher, of Aldwich Manor, Bognor. They included several forms of *Mentha viridis*, some of which had a trace of peppermint scent and one or two of which were free from it, especially one brought by Mr. Shea from his garden, the hybrid *M.* × *sativa, M. gracilis cardiaca, M. crispa* (*M. viridis* × *M. rotundifolia*), *M. rotundifolia* (called in some places 'Apple Mint'), and *M. alopecuroides.* The last two appear to be unsuitable for drying, and are perhaps not so full-flavoured as are the forms of *M. viridis.*

Berberis with Supplementary Leaflet.—Mr. Fletcher also sent foliage of *Berberis Aquifolium* with a supplementary small leaflet arising from the midrib of the leaf at about the middle, and on its upper side near the base of one of the ordinary leaflets as though it were a foliose stipule.

Campanula Hybrids.—Mr. Grove showed seedlings of *Campanula* 'Norman Grove' (*C. Tommasiniana* × *C. carpatica* 'White Star'). Several seedlings had been raised, the result of self-fertilizing the hybrid, and they showed reversion towards both parents. One was a distinct *carpatica* form with a tinge of colour on the outside of the corolla, and at the other extreme a narrow-tubed (but still campanulate) blue-flowered form, approaching *Tommasiniana* in some way, but distinct.

Dodder on Streptocarpus.—Mr. L. Dawes, of Charlton Lea Gardens, Headington, Oxford, sent leaves of a *Streptocarpus* on which a species of *Cuscuta* was flourishing. The parasite was not in flower, and was therefore not identifiable.

Scientific Committee, August 4, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with six members present, and Mr. Grove, visitor.

Leaf-cutting Bee.—Mr. J. Fraser, F.L.S., showed leaves of Laburnum from which pieces had been cut by the leaf-cutting bee for nest-making.

Campanula Hybrids.—Mr. Grove, of Sutton Coldfield, showed a further series of seedlings from *Campanula* 'Norman Grove' self-fertilized. They showed a great range of variation between the parents of *C.* 'Norman Grove' in colour, stature, habit, and foliage. Mr. Grove had taken great pains to record the parentage and

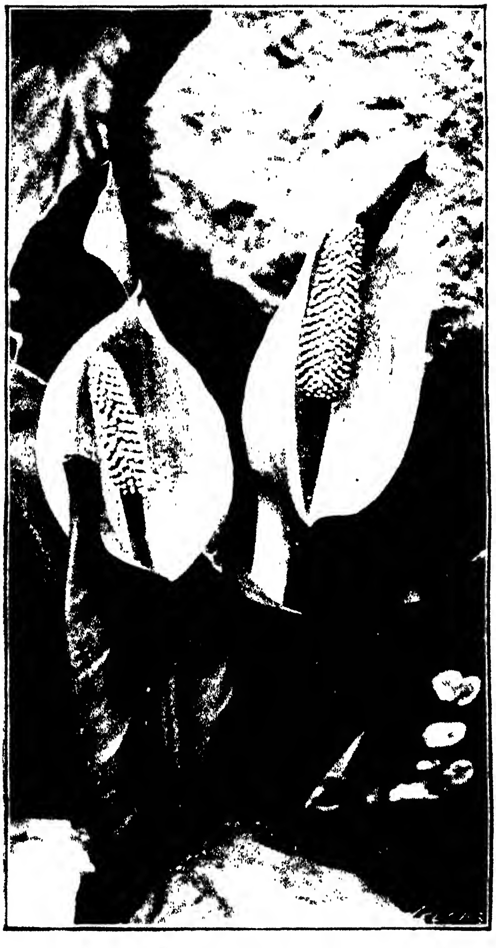


FIG. 91.—LYSICHITUM CAMTSCHATCENSE.
(*Gard. Chron.*) (p. cv.)

To face p. cvii.

Fig. 92.—Plum 'Allgrove's Superb.' (*Gard. Chron.*)
(p. cxvi.)

FIG. 95.—DAPHNE ARBUSCULA. (*Gard. Chron.*) (p. cxvii.)

FIG. 94. ANEMONE RUPICOLA. (*Gard. Chron.*) (p. cxix.)

[*To face p.* cix

variations in the seedlings he had obtained, and the Committee recommended the award of a Certificate of Appreciation to Mr. Grove.

Lime Wood attacked by Fungus.—Mr. E. A. Bowles showed a specimen of Lime from a branch which had fallen from a tree in the avenue at Forty Hall, Enfield, in which the annual rings of wood were separated from one another. This separation had evidently been brought about by a fungus, the mycelium of which could be discerned as a thin pellicle between the rings, but could not be further identified until fruit was obtainable.

A Curious Onion.—Mr. H. J. Chapman showed a curious onion consisting of a basal stem portion from which roots had developed and a fistular leaf of over an inch in diameter and more than a foot in length. It was perhaps the result of injury to the terminal buds of the shoot, and the direction of all the food and water into one channel.

Abnormal Agapanthus.—Mrs. Bischoffsheim sent an inflorescence of *Agapanthus umbellatus* having a few flowers branching from the stem about three inches below the main bulk of them. The stem bent sharply there, and owing to the tension set up had cracked and broken. This kind of malformation is very common in *Agapanthus*.

Malformed Cypripedium.—Mr. C. J. Lucas sent a curious malformed specimen of *Cypripedium warnhamensis* × *C. insigne* upon which Mr. W. C. Worsdell, F.L.S., reported as follows :—The anterior sepal is separating, or rather has begun to divide, into its two original components, as shown by the apical division and the extension of the arc of insertion of the sepal towards the "posterior" side. One of the narrow elongated petals had disappeared. The other had become displaced in order to occupy the median posterior position of the posterior sepal, which has also vanished. Thus there is dimery of the corolla, lateral petal, and labellum in the median plane, and a tendency to dimery of the calyx, which, if it had been carried through, would have resulted in two sepals placed in the transverse plane, at right angles to the two petals. The two lateral stamens of the inner whorl, normally fertile in *Cypripedium*, are here quite absent. Instead, the medium stamen of the inner whorl is present and fertile just above the big staminode.

Scientific Committee, August 17, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Outgrowths on Saxifrage leaf.—Mr. W. H. B. Fletcher, of Aldwich Manor, Bognor, sent leaves of *Saxifraga ligulata* var. *ciliata* with small curious leaf-like outgrowths at the junction of the petiole and leaf-blade.

Podophyllum Emodi.—Mr. H. J. Elwes, F.R.S., showed a fruit of

the plant exhibited by Mr. Allgrove, of Langley, as the large form of *Podophyllum Emodi*, to draw attention to the groove running along its side, which he had not seen in other specimens. The foliage also showed some considerable variation in lobing and size from the normal form of *P. Emodi*.

Rhododendron Foliage damaged.—Mr. J. Ramsbottom, M.A., showed specimens of Rhododendrons from Bournemouth, to call attention to the great amount of damage done to the foliage by two species of fungi which appear to be very prevalent in that district.

Parsley Leaf malformed.—Mr. E. M. Holmes, F.L.S., sent a curious leaf of the common parsley from his garden, in which some of the pinnæ were strap-shaped and entire.

Urginea maritima.—A finely-flowered specimen of what was apparently a white form of *Urginea maritima*, flowering from a bulb collected near Biskra in North Africa, was exhibited by Lady Leon of Bletchley.

FRUIT AND VEGETABLE COMMITTEE.

May 11, 1915.

Mr. A. H. Pearson, J.P., V.M.H., in the Chair, and fifteen members present.

Award Recommended :—

Cultural Commendation.

To Mr. G. W. W. Blathwayt, Porlock Weir, Somerset, for fruit of Shaddock (*Citrus decumana*).

Other Exhibits.

Mr. W. M. Christy, Emsworth : Apple 'Emsworth Pippin.'
Mr. W. H. Divers, Grantham : Apple 'Lord Kitchener.'

Fruit and Vegetable Committee, June 8, 1915.

Mr. A. H. Pearson, J.P., V.M.H., in the Chair, and twelve members present.

Award Recommended :—

Silver Banksian Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for Herbs.

Other Exhibit.

Messrs. Barr, Covent Garden : Dwarf French Beans.

Fruit and Vegetable Committee, Wisley, June 21, 1915.

Mr. Jos. Cheal, V.M.H., in the Chair, and eight members present.

Awards Recommended :—

Award of Merit.

To Peas :—Nos. 64, 'A1'; 66, 'First of the Season'; 143, 'Giant Express'; 83, 'World's Record.'

Highly Commended.

Peas :—Nos. 36, 'American Wonder'; 92, 'Bountiful'; 78, 'Dobbie's Express'; 112, 'The Pilot, Hawlmark Selection'; 56, 'Kelvedon Wonder'; 109, 'British Lion'; 90, 'Chancellor'; 73, 'Model'; 126, 'Sixty Days'; 69, 'May Queen'; 70, 'Early Queen.'

Previous Award Confirmed.

Peas :—Nos. 88, 89, 'William I' (**F.C.C.** 1872); 139, 'Dawn' (**A.M.** 1908); 65, 'Duchess of York' (**A.M.** 1901); 82, 'Thomas Laxton' (**A.M.** 1898); 52, 'Sutton's Harbinger' (**A.M.** 1901).

For descriptions of these varieties see Report on Peas tried at Wisley, 1915, p. 277.

FRUIT AND VEGETABLE COMMITTEE, JUNE 22, 1915.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and ten members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. Bunyard, Maidstone, for a collection of Cherries.

Other Exhibits.

Mr. Cousens, Swanwick : Strawberries.
Mr. Mortimer, Rowledge : Cucumber 'Mortimer's Rival.'

FRUIT AND VEGETABLE COMMITTEE, JULY 6, 1915.

AT HOLLAND PARK.

Mr. JOS. CHEAL, V.M.H., in the Chair, and eighteen members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. xcvi.]

Awards Recommended :—

Silver Banksian Medal.

To Lady Werner (gr. Mr. Metcalfe), Luton Hoo, for a collection of Strawberries.

Cultural Commendation.

To Lady Werner (gr. Mr. Metcalfe), Luton Hoo, for a collection of Strawberries.

Other Exhibits.

Messrs. Bunyard, Maidstone : Cherries.
Mr. Perry, Stoke-by-Nayland : Melon.

FRUIT AND VEGETABLE COMMITTEE, JULY 20, 1915.

Mr. OWEN THOMAS, V.M.H., in the Chair, and ten members present.

Awards Recommended :—

Gold Medal.

To Mr. Allgrove, Slough, for a collection of Gooseberries.

Silver-gilt Knightian Medal.

To Misses Tanner and Tait (gr. Mr. Streeter), Bushey, for a collection of vegetables.

Silver Banksian Medal.

To Messrs. Dobbie, Mark's Tey, for a collection of Peas.

Award of Merit.

To Gooseberry 'Rosebery' (votes, unanimous), from Messrs. Bunyard. Fruit rather small; skin smooth and thin, greenish in colour and excellent in flavour. Early.

To Gooseberry 'Whinham's Industry' (votes, unanimous), from Messrs. Bunyard. A well-known large red variety, of good flavour when ripe. Its great value lies in its earliness in coming into use and its great bearing qualities.

To Cherry 'Waterloo' (votes, unanimous), from Messrs. Bunyard. Fruit of medium size, black and strong, roundish, sometimes broader than it is deep; flesh dark red and exceedingly sweet; stone very small. The tree is a free bearer and is popular as a garden and market variety. Raised by T. A. Knight in 1815.

Other Exhibits.

Messrs. Laxton, Bedford: Plum 'Laxton's Early July.'
Mr. S. Mortimer, Farnham: Tomato 'Tip Top.'

FRUIT AND VEGETABLE COMMITTEE, WISLEY, JULY 29, 1915.

Mr. OWEN THOMAS, V.M.H., in the Chair, and eight members present.

Awards Recommended:—

The following awards to Potatos were recommended subject to the cooking test. (See p. cxiv.)

Award of Merit.

To Potatos:—Nos. 16, 'Duke of York'; 87, 'Stretton No. 9.'

Highly Commended.

Potatos:—Nos. 11, 'Gladiator'; 57, 'Hero King'; 2, 'Ninety-fold'; 78, 'Warwick Castle'; 79, 'Stirling Castle.'
Cabbage:—30, 'Veitch's Earliest of All.'

Previous Award Confirmed.

Potatos:—Nos. 118, 'Arduthie Early' (**A.M.** Aug. 1, 1911); 26, 'May Queen' (**A.M.** Aug. 15, 1905); 6, 'Midlothian Early' (**A.M.** July 31, 1908).

See Report on Early and Mid-Season Potatos at Wisley, 1915, p. 290.

Fruit and Vegetable Committee, August 4, 1915.

Mr. A. H. Pearson, V.M.H., in the Chair, and twelve members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To the Government of New Zealand, for an exhibit of Apples.

This collection of Apples was grown in New Zealand, collected from the Cromwell Development Company and the Otago Expansion League, sent by Messrs. Adolph Moritzson, of Dunedin, and exhibited by the High Commissioner of New Zealand, 13 Victoria Street, London, S.W.

The Tonkin's Trustees, of Treliske Orchard, Ettrick, contributed the following varieties :—

'Cleopatra,'
'Delicious,'
'Esopus Spitzenberg,'
'Jonathan,'
'Munroe's Favourite,'
'Rome Beauty,'
'Scarlet Nonpareil,'
'Sturmer Pippin.'

The Upper Clutha Association, Cromwell, N.Z., sent—

'Ballarat Seedling,'
'Cleopatra,'
'Jonathan,'
'Lord Wolseley,'
'Scarlet Nonpareil,'
'Sturmer Pippin.'

And from Mr. Albert Birch, of Birchdale Orchard, Teviot, came 'Cleopatra' and 'Esopus Spitzenberg.'

Silver Banksian Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Aldenham, for six dishes of Cherries.

To Messrs. Spooner, Hounslow, for an exhibit of Apples.

The Committee examined the Potatos recommended for award at Wisley, after cooking, and confirmed the awards recommended to No. 6, 'Midlothian' Early (**A.M.** July 31, 1908) ; 16, 'Duke of York.'

The other awards were not confirmed, as the Potatos did not pass the cooking test.

Other Exhibits.

Messrs. Bunyard, Maidstone : Gooseberries.
Messrs. Laxton, Bedford : Plum 'Early July.'
Mr. R. Staward, Panshanger : Peach 'Lord Desborough.'

Fruit and Vegetable Committee, August 4, 1915.

Mr. A. H. Pearson, V.M.H., in the Chair, and twelve members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To the High Commissioner for New Zealand, for a collection of Apples.

Silver Banksian Medal.

To Messrs. Spooner, Hounslow, for an exhibit of Apples.

To Hon. Vicary Gibbs, Aldenham, for six dishes of Cherries.

Other Exhibits.

Messrs. Bunyard, Maidstone: Gooseberries.
Messrs. Laxton, Bedford: Plum 'Early July.'
Mr. R. Staward, Panshanger: Peach 'Lord Desborough.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 17, 1915.

Mr. J. CHEAL, V.M.H., in the Chair, and ten members present.

Awards Recommended :—

Gold and Lindley Medals.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for vegetables.

Other Exhibits.

Mr. J. C. Allgrove, Langley: Apple 'St. Everard.'
Messrs. Bide, Farnham: Tomato 'The Recruit.'
Lord Hillingdon, Uxbridge: Apple 'Langley Pippin.'
Mr. T. W. Hunt, Northampton: Runner Beans.
Mr. J. W. Irvine, West Malvern: Melons.
Messrs. Laxton, Bedford: Plum 'Laxton's Utility.'
Mr. J. E. Westmore, Wroxhall: Pea 'Wroxhall Surprise.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 19, 1915.

SUB-COMMITTEE AT WISLEY.

Mr. OWEN THOMAS, V.M.H., in the Chair, and six members present.

A Sub-Committee inspected the Trial of Early and Mid-Season Potatos, and made recommendations for awards to be approved at the meeting of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 31, 1915.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To C. A. Cain, Esq. (gr. T. Pateman), Welwyn, for fruit.

Silver Banksian Medal.

To Messrs. Spooner, Hounslow, for fruit.

To Messrs. Sutton, Reading, for Runner Beans.

First-class Certificate.

To Himalayan Blackberry (votes, unanimous), from Messrs. Laxton, Bedford. Grown at Wisley. The plant is a vigorous grower, producing very large trusses of fruit. The crop is heavy and extends over a long period—at least two months. The fruit is very large, quite black, of excellent flavour, but rather more acid than our native blackberry.

Award of Merit.

To Nectarine 'Milton' (votes, unanimous), from Lord Hillingdon (gr. Mr. A. R. Allan), Uxbridge. A comparatively old variety raised by Messrs. Rivers. Fruit large, handsome; skin very dark red on the exposed side; flesh greenish white, but tinged with red near the stone, very juicy and of excellent flavour. When grown outside the fruit is fit for use about the middle of September. The tree is said to be a good grower and a free bearer.

To Plum 'Allgrove's Superb' (votes, unanimous), from Mr. J. C. Allgrove, Slough. This variety is a sport from the well-known 'Jefferson' and possesses all the good qualities of that variety, but differs in the colour, which is reddish violet. The time of ripening is two or three weeks earlier than that of 'Jefferson' (fig. 92).

Cultural Commendation.

To Mr. A. R. Allan, Uxbridge, for Nectarine 'Milton.'

To Mr. W. Pope, Newbury, for Apple 'Charles Eyre.'

The awards recommended by the Sub-Committee at Wisley to Early and Mid-Season Potatos on August 19 were confirmed. *Award of Merit.*—No. 7, 'Old Yellow Ashleaf'; No. 79, 'Stirling Castle'; No. 101, 'Arran Chief'; No. 95, 'Stretton No. 20'; No. 75, 'Wolfe's Secundus.' *Commended.*—No. 31, 'General Joffre.'

For descriptions see Report on Early and Mid-Season Potatos at Wisley, 1915 (p. 290).

Other Exhibits.

Messrs. Bunyard, Maidstone: Apple 'Maidstone Favourite.'
Messrs. Chapman, Rye: Tomato 'Peachblow.'
R. L. Curtis, Esq., J.P., Highgate: Figs.
Messrs. Daniels, Norwich: Black Currant 'The Norwich Belle.'
Mr. G. W. Miller, Wisbech: Gooseberry 'Omega.'
Mr. W. Taylor, Hampton: Peach 'Libra.'

FIG. 95.—LEWISIA COLUMBIANA. (*Gard. Mag.*) (p. cxix.)

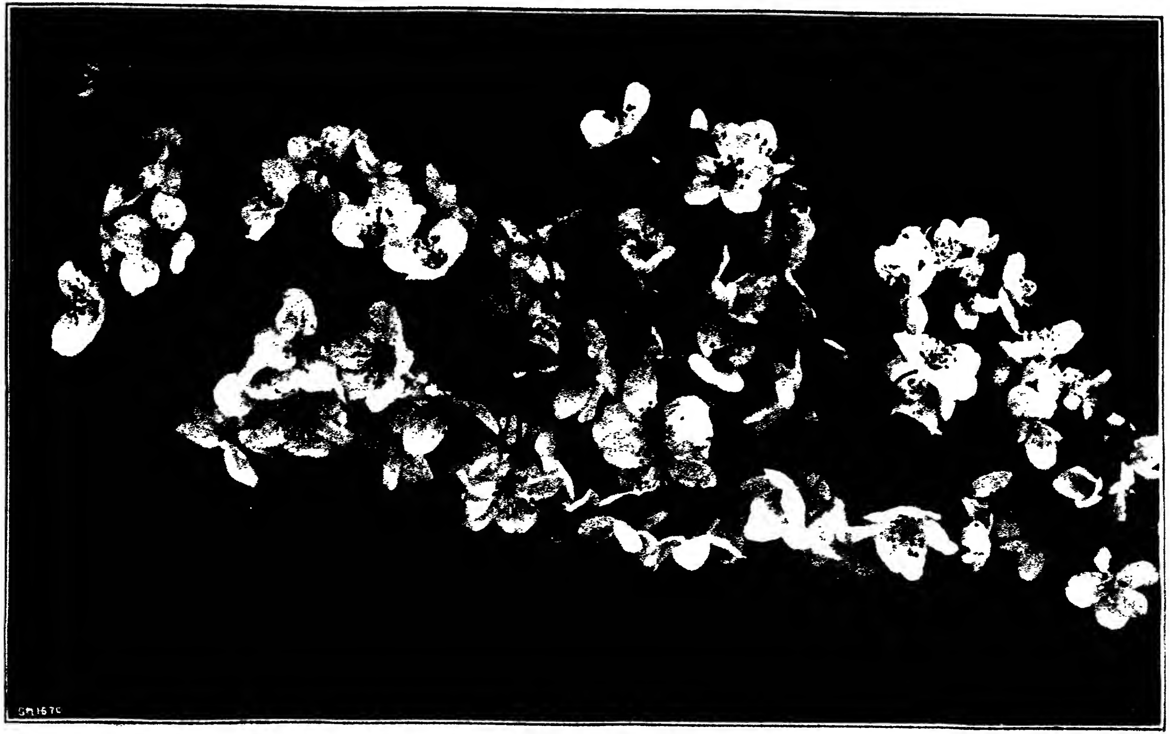


Fig. [illegible]—Pyrus Malus Sargentii. (Gard. Mag. [illegible])

FLORAL COMMITTEE.

MAY 11, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. F. Cant, Colchester, for Roses.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Cutbush, Highgate, for Roses.
To Messrs. May, Upper Edmonton, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. A. Dawkins, Chelsea, for Schizanthus.
To Mr. J. Douglas, Great Bookham, for Auriculas.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Low, Bush Hill Park, for Carnations &c.
To R. McConnell, Esq., Bromley, for *Cineraria stellata.*
To Messrs. Phillips & Taylor, Bracknell, for Auriculas &c.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Mr. G. Reuthe, Keston, for alpines and flowering shrubs.

Bronze Flora Medal.

To Messrs. Carter Page, London Wall, for Violas and annuals.
To Messrs. Piper, Bayswater, for alpine plants.
To Mr. C. Turner, Slough, for *Pyrus*.
To Messrs. Ware, Feltham, for alpines.
To Messrs. Waterer, Sons, & Crisp, London, for alpine plants.

Bronze Banksian Medal.

To Mr. J. G. Allgrove, Slough, for Aubrietias.
To Messrs. Cheal, Crawley, for flowering shrubs.
To Mr. P. Ladds, Swanley, for Salvias and Pelargoniums.
To Right Hon. Colonel Mark Lockwood, M.P. (gr. Mr. Cradduck), Romford, for Schizanthus.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Mr. L. R. Russell, Richmond, for alpine plants.
To Messrs. Tucker, Oxford, for alpine plants.
To Messrs. Wells, Merstham, for Antirrhinums.

Award of Merit.

To *Ceanothus rigidus verus* (votes, unanimous), from Miss Willmott, F.L.S., V.M.H., Great Warley. This plant is the true *Ceanothus rigidus*, and differs considerably from the plant to which this name is generally attached. It is a very much branched shrub, bearing crowded bunches of rich purple-blue flowers in great profusion. The leaves are small, dark green, glossy, roundish, nearly sessile, and the margin is beset with a few short spiny teeth. The plant is generally found to be hardy in this country, and is a native of California.

To *Clematis aphylla* (votes, 10 for, 4 against), from Miss Willmott, F.L.S., V.M.H., Great Warley. A hardy species suitable for walls. Its whorls of pale yellow flowers are borne on long, leafless, rush-like stems.

To *Daphne arbuscula* (votes, 17 for, 1 against), from Mr. G. Reuthe, Keston. A dwarf species from Transylvania, bearing heads of rosy-lilac flowers larger but less crowded than those of *D. Cneorum*. The flowers are scented, and the narrow dark-green leaves are about 1 inch long. (Fig. 93.)

Other Exhibits.

Messrs. Barr, Taplow: alpine plants.
Mr. J. Box, Haywards Heath: alpine plants.
Messrs. Clark, Dover: hardy plants.
Mr. C. Davis, Hayes: Viola 'Zelia.'
Miss C. M. Dixon, Edenbridge: alpine plants.
Mr. C. Elliott, Stevenage: Gentians.
G. Ferguson, Esq., Weybridge: Geum 'Mrs. G. Ferguson.'
Mr. W. C. Foote, Ticehurst: Carnation 'W. C. Foote.'
Misses Hopkins, Shepperton: hardy plants.
Lady Hunter, Haslemere: *Lysichitum camtschatcense*.
Messrs. Jarman, Chard: Pelargoniums and Violas.
Miss Jekyll, Godalming: *Lunaria biennis* 'Minstead Purple.'
Mr. G. Kerswill, Exeter: Gentians.
F. Lloyd, Esq., Croydon: Aubrietias.
W. R. Lysaght, Esq., Chepstow: Primula 'Mrs. W. R. Lysaght' and *Oxalis brasiliensis*.
Lieut.-Colonel Mainwaring, Upwey: *Lonicera Griffithii*.
Miss Mangles, Seale: Rhododendrons.
Messrs. Paul, Cheshunt: Hydrangeas.
Messrs. Reamsbottom, Geashill: Anemones.
Messrs. Young, Cheltenham: Carnations.

Floral Committee, May 18, 1915.

At Chelsea.

Mr. H. B. May, V.M.H., in the Chair, and eighteen members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. lxxxvi.]

Awards Recommended :—

Award of Merit.

To *Anemone rupicola* (votes, 9 for), from Messrs. Bees, Liverpool. A hardy species introduced by Forrest from China, suitable for the rock garden. The flowers are single, white, with the outer sepals tinged with lilac, about 2½ inches in diameter when fully open, slightly drooping. The foliage is finely cut and shiny. The plant grows about 9 inches high. (Fig. 94.)

To Carnation 'Bookham Clove' (votes, 9 for, 3 against), from Mr. J. Douglas, Great Bookham. A dark crimson 'Border' variety, with a very strong scent. The flowers are large and have perfect non-bursting calyces, while the stems are very strong and rigid.

To Carnation 'Daisy Walker' (votes, 12 for), from Mr. J. Douglas, Great Bookham. A fancy 'Border' variety having a pure white ground lightly marked with rose-scarlet.

To *Lewisia columbiana* (votes, 7 for, 3 against), from Miss Willmott, F.L.S., V.M.H., Great Warley. An erect and very free-flowering species, growing about 9 inches high. The flowers are white, streaked with bright rose-pink, and are tinged with orange-buff in the young state. The flower-stems are reddish, and the leaves are narrow and spathulate. (Fig. 95.)

To *Pyrus Malus Sargentii* (votes, 14 for), from Messrs. G. Paul, Cheshunt. A very free-flowering and much-branched hardy tree from Japan. Its flowers are creamy white in colour, and are borne much later than those of other Crabs. (Fig. 96.)

To Rose 'Dewdrop' (votes, 7 for, 1 against), from Messrs. Hobbies, Dereham. A dwarf Polyantha variety, bearing bright rose-pink double flowers with rounded petals.

To Rose 'Paul's Scarlet Climber' (votes, unanimous), from Messrs. W. Paul, Waltham Cross. A strong-growing climber, bearing clusters of semi-double scarlet flowers in great profusion. Many of the clusters consist of about fifteen blooms, which last in good condition for a considerable period.

To *Senecio multibracteatus*, 'Clare Lodge' variety (votes, unanimous), from Mr. E. Novell, Clare Lodge Gardens, Ipswich. A beautiful greenhouse plant, raised from seed sent from the Cape. The flowers are borne in great abundance, and measure 2½ inches across. The ray florets are rosy mauve and the disc golden yellow. The plant grows about 3 feet high.

To *Viola septentrionalis* (votes, unanimous), from Miss A. Leonard, Hitchin. A scentless species, bearing white flowers with blue markings at the base of the petals.

Other Exhibits.

Mr. J. C. Allgrove, Slough: *Primula sibirica, Anacyclus formosus, Aquilegia ecalcarata.*

Messrs. Baker, Codsall: *Pentstemon Roezlii, Primula Bulleyana magnifica.*

Messrs. Barr, Taplow: *Paeonia Mokoswitschi.*

Messrs. Blackmore & Langdon, Bath: Delphinium 'Mrs. A. J. Watson.'

G. W. W. Blathwayt, Esq., Chelford: *Pelargonium crispum maximum variegatum.*

Donard Nursery Co., Newcastle: *Leptospermum scoparium Boscawenii*, **A.M.** 1912.

Mrs. Hammond, Salisbury: Pelargoniums.

Messrs. Jackman, Woking: Clematis 'King of the Belgians.'

Messrs. Jefferies, Cirencester: Schizanthus 'Pink Beauty,' Calceolaria 'Cotswold Hybrid.'

Messrs. T. Low, Bush Hill Park: Carnations.

W. R. Lysaght, Esq., Chepstow: Primula 'Mrs. W. R. Lysaght.'

J. Mallender, Esq., Bawtry: *Anemone Mallenderi.*

Rev. J. H. Pemberton, Havering-atte-Bower: Rose 'Pemberton's White Rambler.'

Mr. A. Perry, Enfield: hardy plants.

Mr. T. Smith, Kingston Hill: *Primula pulverulenta* 'Salmon Queen.'

Mr. J. Stevenson, Wimborne: Sweet Peas.

Mr. J. Sweet, Salisbury: Viola 'Jesse Sweet.'

Messrs. R. Wallace, Colchester: *Primula silvicola*, Iris 'The Dove.'

Floral Committee, Wisley, June 3, 1915.

Mr. H. B. May, V.M.H., in the Chair, and seven members present.

The trial of Tall Bearded Iris was inspected and a number of varieties were selected for further trial next year.

Floral Committee, June 8, 1915.

Mr. H. B. May, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended :—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas, Aquilegias, and Antirrhinums.

Silver-gilt Banksian Medal.

To Messrs. Bide, Farnham, for Sweet Peas.
To Messrs. A. Dickson, Newtownards, for Sweet Peas.
To Messrs. Kelway, Langport, for Pæonies.
To Mr. A. Perry, Enfield, for Poppies and Irises.
To Messrs. Wallace, Colchester, for Irises.

FIG. 97.—DIANTHUS × WOODFORDIENSIS (*D. alpinus* × *D. deltoides*.)
(p. cxxii.)

[*To face p. cxx*

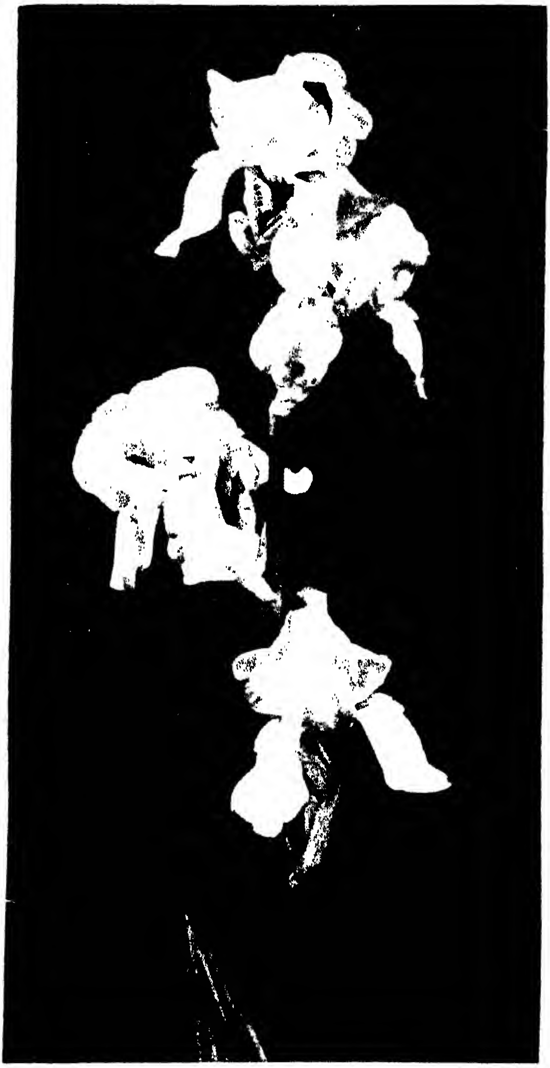


FIG. 98.—IRIS 'LOHENGRIN.' (*Wallace.*)
(p. cxxii.)

Silver Lindley Medal.

To J. T. Bennett-Poë, Esq. (gr. Mr. Downes), Cheshunt, for *Utricularia montana.*

Silver Flora Medal.

To Mr. Allgrove, Slough, for hardy plants.
To Messrs. Artindale, Sheffield, for Violas.
To Messrs. Barr, Taplow, for hardy plants.
To Mr. J. Box, Haywards Heath, for hardy plants.
To Messrs. Paul, Cheshunt, for shrubs.
To Messrs. Peed, Norwood, for Gloxinias and *Streptocarpus.*
To Mr. G. Prince, Longworth, for Roses.
To Messrs. Waterer, Sons, & Crisp, London, for hardy plants.

Silver Banksian Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cutbush, Highgate, for greenhouse and hardy plants.
To Mr. E. J. Hicks, Hurst, for Roses.
To Messrs. T. Low, Bush Hill Park, for Carnations &c.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. Piper, Bayswater, for hardy plants.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Ware, Feltham, for hardy plants.

Bronze Flora Medal.

To Messrs. Bunyard, Maidstone, for hardy plants.

Bronze Banksian Medal.

To Messrs. Brown, Peterborough, for hardy plants.
To Messrs. Cheal, Crawley, for flowering trees and shrubs.
To Miss Dixon, Edenbridge, for rock plants.
To Mr. C. Elliott, Stevenage, for alpine plants.
To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for *Streptocarpus.*
To W. A. Milner, Esq., Sheffield, for hardy Primulas.
To Mr. L. R. Russell, Richmond, for shrubs.
To Messrs. Thompson & Charman, Bushey, for hardy plants.
To Messrs. Whitelegg & Page, Chislehurst, for alpine plants.

Award of Merit.

To *Aster alpinus* 'Nancy Perry' (votes, 11 for, 5 against), from Mr. A. Perry, Enfield. The flowers of this variety measure 2 inches in diameter and are semi-double. The ray florets are pale violet-mauve in colour, and the disc is golden-yellow. Nine inches is the normal height of the plant.

To *Cotyledon simplicifolia* (votes, 9 for, 3 against), from Miss Willmott, F.L.S., V.M.H., Great Warley, and Messrs. Waterer, Sons, & Crisp, London. This species grows about 6 inches high, and bears a branched inflorescence usually having three drooping racemes of

small yellow flowers on reddish stems. The foliage is small, roundish, and irregularly crenated.

To *Delphinium venustum* (votes, 16 for, 3 against), from Miss Willmott, F.L.S., V.M.H., Great Warley. This Delphinium is extremely valuable on account of its early-flowering habit, being usually at its best during May. The flowers are large, single, deep blue with dark eye, and are borne on not overcrowded spikes measuring about 2 feet in length.

To *Dianthus neglectus* 'Aurora' (votes, 14 for, 1 against), from Mr. R. A. Malby, Woodford. A very fine variety of the 'Glacier Pink,' having deep rose-pink flowers measuring 1½ inch across, with a distinct yellow-buff reverse to the petals.

To *Dianthus* × *woodfordiensis* (votes, 14 for, 1 against), from Mr. C. Elliott, Stevenage. A pretty hybrid between *D. alpinus* and *D. deltoides*, bearing pale rose-pink flowers 1 inch in diameter, with a ring of deeper pink in the centre. The plant grows about 4 inches high, and is said to bloom over a long period. (Fig. 97.)

To Iris 'Lohengrin' (votes, 18 for), from Messrs. Wallace, Colchester. A large-flowered, tall, bearded variety belonging to the *pallida* section. Inflorescence 3-flowered, spathe valves scarious, pedicels short, flowers close, depth 3½ inches, substance good, falls broad, deep purplish lavender; veins distinct, haft white, veins purple; beard white, tipped yellow; standards deep bluish lavender, erect; styles blue, margins white. (Fig. 98.)

To Iris 'Lord of June' (votes, 15 for), from Mr. G. Baker, Bexley. A very large-flowered variety of the *pallida* section. The standards are lavender blue, and the falls violet with a prominent gold beard.

To Iris 'Rotherside Masterpiece' (votes, 16 for), from Messrs. H. Chapman, Rye. This variety is a seedling selected from a strain raised by intercrossing the Dutch Irises, and it possesses greater substance and length of stem than the Spanish Irises. The standards are almost white, and the falls are bright lemon-yellow blotched with orange-yellow. This and other varieties of the strain flower earlier than *Iris Xiphium*.

To *Lonicera Maackii* (votes, 17 for), from Hon. Vicary Gibbs (gr. Mr. Beckett, V.M.H.), Elstree. A Chinese species producing slender, arching branches, which bear numerous small creamy-white flowers. The leaves are lanceolate-ovate.

To *Micromeles Folgneri* (votes, unanimous), from Hon. Vicary Gibbs, Elstree. A deciduous tree collected in Western China by Mr. E. H. Wilson. It is said to grow 20–25 feet high, and bears corymbs of creamy-white flowers, which are produced during May. Leaves ovate-lanceolate, dentate, deep green on upper surface and silver-grey beneath. (See JOURNAL R.H.S. xl., p. 217, fig. 47.)

To *Olearia insignis* (votes, unanimous), from Mr. R. C. Notcutt. Woodbridge. A rare species, bearing flowers measuring 2½ inches in diameter. The ray florets are white, and the disc honey-yellow. The ovate foliage is very striking, being leathery in texture and

covered with dense white tomentum, which is also found on the flower-stalk and involucre.

To *Oxytropis hybrida grandiflora alba* (votes, 16 for), from Mr. A. Perry, Enfield. This plant is believed to be a natural hybrid between two North American species. It produces bold spikes crowded with white flowers blotched with purple, and faintly lined with the same colour on the standard.

To *Papaver orientale* 'Perry's Pigmy' (votes, 19 for, 2 against), from Mr. A. Perry, Enfield. This variety is the best of a new race of dwarf perennial Poppies of stiff, erect habit, growing 18 inches high. The flowers are salmon-pink, blotched with dark crimson at the base of the petals. They are said to last well in water when cut. (Fig. 99.)

To *Primula* 'Ladybird' (votes, 11 for, 5 against), from W. A. Milner, Esq., Sheffield. A seedling variety from a hybrid obtained by crossing *P. pulverulenta* and *P. Bulleyana*. The flowers are deep rose, with a darker eye. The plant is about 2 feet high.

To Rose 'Yellow Bird' (votes, 13 for), from Mr. C. Turner, Slough. A very free-flowering seedling climbing rose, having creamy-white flowers and shining foliage.

To *Syringa Sweginzowii* (votes, 12 for), from Hon. Vicary Gibbs, Elstree. A new Chinese species bearing panicles of small, purplish mauve, fragrant flowers with white corolla lobes.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.

Messrs. Cannell, Eynsford: hardy plants.

J. A. Christie, Esq., Norwich: Primula 'Mabula.'

Messrs. Clark, Dover: hardy plants.

Mr. H. J. Damerum, Hayling Island: Sweet Pea 'Mrs. H. J. Damerum.'

Mr. G. R. Downer, Chichester: Lupine 'May Queen.'

Messrs. Felton, Hanover Square: Japanese gardens and dwarf trees.

Mrs. Greenhow, Esher: Ixias.

Mr. D. Hazelwood, Aberford: *Haemanthus Katherinae.*

Misses Hopkins, Shepperton: hardy plants.

Messrs. Ladhams, Southampton: hardy plants.

Elizabeth, Lady Lawrence, Dorking: *Conanthera campanulata.*

Mr. F. Oldham, Shifnal: unnamed Pansy.

Messrs. Carter Page, London Wall: Dahlias and Violas.

Mr. G. Pimlott, Northenden: unnamed Viola.

Mr. G. H. H. Wassell, Baughurst: *Heuchera micrantha hybrida* 'Heath End Strain.'

Messrs. Young, Cheltenham: Carnations.

Floral Committee, Wisley, June 11, 1915.

Mr. H. B. May, V.M.H., in the Chair, and seven members present.

Awards Recommended :—

Highly Commended.

To Pyrethrum :—Nos. 24, 'Firefly'; 13, 'Langport Scarlet'; 34, 176, 'Punch'; 38, 'Roseum'; 19, 'Snow White' (**A.M.** June 7, 1910); 123, 'Fulgens Plenissimum.'

To Hybrid Lupine 'E. H. Woodhouse.'

Commended.

To Pyrethrum :—Nos. 107, 'Andromeda'; 106, 'Aphrodite'; 110, 'Boccace'; 71, 'Eglantine'; 58, 118, 'Ernest Kelway'; 82, 'Gem'; 30, 81, 'General Gaselee'; 16, 'J. M. Twerdy'; 183, 'Le Dante'; 22, 37, 'Queen of Whites'; 36, 'Record'; 154, 'Samranburgh'; 10, 'Souce.'

'For descriptions see Pyrethrums at Wisley, 1915' (p. 265).

The inspection of the Iris trial was concluded.

It was resolved to continue the trial of Bearded Irises with plants which have been this year selected and certain others as types, and to invite growers to send fully developed rhizomes of new varieties by the second week in September.

To defer the report until 1916.

To obtain a report on the classification of Bearded Irises by a Sub-Committee consisting of Sir A. Hort, Messrs. Bowles, Barr, Wallace, Dykes, and Titchmarsh.

Floral Committee, June 22, 1915.

Mr. H. B. May, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Gold Medal.

To the Right Hon. Lord North (gr. Mr. James), Banbury, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Wallace, Colchester, for Eremuri and hardy flowers.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.

To Mr. Box, Lindfield, for hardy flowers.

To Messrs. Carter, Raynes Park, for English Irises.

To Messrs. Godfrey, Exmouth, for Canterbury Bells.

To Messrs. Kelway, Langport, for Delphiniums.

FIG. 99.—PAPAVER ORIENTALE 'PERRY'S PIGMY,' WITH AN ORDINARY FORM FOR COMPARISON. (p. cxxiii.)

[*To face p.* cxxiv.

FIG. 100.—CAMPANULA PUSILLA 'MISS WILLMOTT.' (*Gard. Mag.*)
(p. cxxv.)

FIG. 101.—ROSE 'CUPID.' (*B. R. Cant.*) (p. cxxvi.)

FIG. 102.—BEGONIA 'LORD METHUEN.' (p. cxxvii.)

[*To face p.* cxxv.

To Messrs. May, Edmonton, for greenhouse plants.

To Mr. Miller, Wisbech, for Delphiniums.

To Messrs. Low, Bush Hill Park, for Malmaison Carnations and Roses.

To Messrs. Waterer, Son, & Crisp, Liverpool Street, E.C., for rock plants and hardy flowers.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy flowers.

To Messrs. Bath, Wisbech, for Paeonies and Delphiniums.

To Messrs. Brown, Peterborough, for Roses.

To Messrs. Clark, Dover, for hardy flowers.

To Messrs. Ladham, Southampton, for hardy flowers.

To Messrs. Paul, Cheshunt, for Roses and shrubs.

To Mrs. Prichard, Christchurch, for alpine plants.

To Mr. Russell, Richmond, for Clematis.

Bronze Flora Medal.

To G. Ferguson, Esq., Weybridge, for Delphiniums.

Bronze Banksian Medal.

To Messrs. Bide, Farnham, for Sweet Peas.

To Messrs. Bunyard, Maidstone, for alpine plants and hardy flowers.

To Messrs. Peed, Norwood, for Gloxinias.

To Messrs. Piper, Bayswater, for rock plants.

To Mr. Reuthe, Keston, for miscellaneous plants.

To Messrs. Ware, Feltham, for hardy flowers.

To Messrs. Young, Cheltenham, for Carnations.

Award of Merit.

To *Campanula pusilla* 'Miss Willmott' (votes, 15 for), from Mr. C. Elliott, Stevenage. A charming plant, a pale silvery-blue-flowered form of *C. pusilla*. (Fig. 100.)

To Delphinium 'Queen of the Belgians' (votes, 15 for, 4 against), from G. Ferguson, Esq. Spike long, flowers compact; pedicels short, 2 inches in diameter, round; clear pale blue, just tinged with mauve on the inner segments; staminodes pale, with distinct yellow hairs.

To *Erigeron hybridus* 'Asa Gray' (votes, unanimous), from Messrs. Wallace, Colchester. The plant reaches a height of 18 inches; flowers very freely produced, 1½–2 inches in diameter; ray florets pale buff, becoming bright straw colour in strong light; disc golden yellow.

To Godetia 'Lavender' (votes, unanimous), from Messrs. Carter, Raynes Park. An attractive variety, distinct both in its erect branching habit and the colour of its flowers, which are pale purplish-lavender, with a white throat and almost violet eye.

To *Iris filifolia* (votes, unanimous), from W. R. Dykes, Esq., Godalming. This plant is the true *I. filifolia* of Boissier, and not the plant closely allied to *I. tingitana* which is commonly met with under

this name. It may be described as a glorified *I. Boissieri.* The flower is purple-violet, with a golden blotch, surrounded by a bright purple region on the arch of the falls. The style-crests are very large.

To *Linaria macedonica speciosa* (votes, 12 for), from Messrs. Waterer, Son, & Crisp, Liverpool Street, E.C. This plant resembles the common toad-flax. The flowers are, however, borne on a long raceme, very large, with the upper corolla lobes hooded; leaves cordate, acute.

To Rose 'Cupid' (votes, 13 for), from Messrs. B. R. Cant, Colchester. A Hybrid Tea variety with single flowers, 4½ inches in diameter, deep salmon pink, paling to flesh pink; stamens very bright yellow. (Fig. 101.)

Other Exhibits.

Mr. Appleton, Bedford: dwarf Marguerite Daisy.
Messrs. Cheal, Crawley: shrubs.
Captain Drummond, Southampton: Carnation 'Mrs. Maldwin Drummond.'
Mr. Dutton, Iver: Border Carnation 'Iver Yellow.'
Mr. C. Elliott, Stevenage: alpine plants.
Mr. Frost, Cromer: Anchusas.
Mr. Hicks, Twyford: Roses.
Misses Hopkins, Shepperton: rock plants.
Right Hon. Colonel Mark Lockwood, Romford: Fuchsias.
Mrs. Lloyd Edwards, Llangollen: rock plants.
Messrs. Carter Page, London Wall: Dahlias.
Mr. Sage, Cambridge: Antirrhinums.
Messrs. Sutton, Reading: Brompton Stock 'Express.'
Messrs. Thompson & Charman, Bushey: hardy flowers.
Messrs. Tucker, Oxford: rock plants.
Mr. Wassell, Baughurst: Delphinium 'Muriel.'
Messrs. Whitelegg & Page, Chislehurst: hardy flowers.
Miss Willmott, V.M.H., Great Warley: Delphinium 'Sir Dighton Probyn' and *Lithospermum Froebeli.*
Mr. Woolman, Birmingham: Zonal Pelargoniums.

FLORAL COMMITTEE, JULY 6, 1915.

AT HOLLAND PARK.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. xcvi.]

Awards Recommended:

First-class Certificate.

To *Lilium regale* (votes, unanimous), from Miss Willmott, V.M.H., Great Warley. This plant is described and figured as *L. myriophyllum*, JOURNAL R.H.S. vol. xxxviii. p. cxxxv.

Award of Merit.

To Begonia 'Lord Methuen' (votes, 5 for, 2 against), from Messrs. Blackmore & Langdon, Bath. A bedding variety of free-flowering habit. Each flower exceeds 5 inches in diameter, is double, frilled, and bright scarlet. (Fig. 102.)

To Begonia 'Mrs. W. Cuthbertson' (votes, unanimous), from Messrs. Blackmore & Langdon, Bath. A bedding variety bearing very large double, frilled, rose-pink flowers on stiff stems. (Fig. 103.)

To *Erica cinerea atrorubens* (votes, 6 for, 3 against), from Mr. G. Reuthe, Keston. A very bright rose-red-flowered form of the bell-heather.

To Hemerocallis 'Golden Bell' (votes, 15 for), from Messrs. Wallace, Colchester. A handsome seedling of *H. flava*, bearing large, deep lemon-yellow flowers with broad segments.

To *Lilium* 'Amos Perry' (votes, 11 for), from Mr. Amos Perry, Enfield. This plant is said to be a hybrid between *L. Humboldti* and *L. Parryi*. It has the general appearance of the former in foliage and flower, but the flowers are much larger, and borne in pairs or threes; segments broad, pointed, recurved, deep orange-yellow, blotched around the throat with brown.

To Sweet Pea 'Jean Ireland' (votes, unanimous), from Messrs. Dobbie, Edinburgh. A Spencer variety, cream, with a broad margin of soft pink.

To Rose 'Queen Alexandra' (votes, 7 for, 3 against), from Rev. H. Pemberton, Romford. A Hybrid Tea variety. It is said to be a perpetual flowerer; flowers quite single, pale citron-yellow flushed with pink when young, fading with age to white.

To Rose 'Queen of Fragrance' (votes, 6 for), from Messrs. W. Paul, Waltham Cross. A Hybrid Perpetual variety, rather short-petalled but well formed, soft rose, and very strongly scented. It was awarded the 'Clay' Challenge Cup in 1914.

To *Verbena chamaedryoides* (votes, unanimous), from Mr. R. Prichard, West Moors. An exceptionally large plant was exhibited. The habit is procumbent; leaves opposite, lanceolate, serrate, rough; flowers about ½ inch in diameter, bright scarlet.

Other Exhibits.

Mr. Appleton, Bedford: dwarf Marguerite Daisy.

Mr. Allgrove, Slough: new herbaceous Senecios.

Messrs. Baker, Wolverhampton: Delphiniums.

Messrs. Bees, Liverpool: *Ranunculus Lyalli, Primula pulchella, Clematis chrysocoma, Rodgersia pinnata rosea, Silene laciniata Purpusii.*

Messrs. Bunyard, Maidstone: Delphinium 'Queen Mary.'

Messrs. Clark, Dover: *Pentstemon isophyllus, Polystichum angulare Clarkii.*

Messrs. Hugh Dickson, Belfast: Roses.

Mr. Douglas, Great Bookham: Border Carnations.

Mr. Gaunt, Leeds: *Campanula linifolia.*

Hon. V. Gibbs, Aldenham: *Viburnum dasyanthum.*
Sir R. J. Graham, Carlisle: Carnation 'Lady Cynthia.'
Mr. Hicks, Twyford: Rose 'Joanna Bridge.'
Messrs. Hobbies, Dereham: Sweet Peas and Roses.
Messrs. Kelway, Langport: Delphiniums.
Mr. Le Cornu, Jersey: Roses.
Mrs. Lloyd Edwards, Llangollen: Heuchera 'Queen Mary.'
Mr. Notcutt, Woodbridge: Delphiniums.
Lady Phillimore, Campden Hill: *Crinum Johnstonii.*
Mr. Stevenson, Wimborne: Sweet Peas.
Mr. Turner, Slough: Fuchsia 'Yvonne de Bray.'
Messrs. Veitch, Exeter: *Crinum yemense, Sorbus cuspidata, Sorbus vestita.*
Messrs. Ware, Feltham: Delphiniums and Begonias.
Mr. Weller, Ashtead: Wichuraiana Roses.
Messrs. Wells, Merstham: Carnation 'Laura Webber.'

Floral Committee, July 20, 1915.

Mr. H. B. May, V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Lieut.-Col. Rt. Hon. Mark Lockwood, C.V.O. (gr. Mr. Cradduck), for Fuchsias and *Trachelium coeruleum.*
To Messrs. H. J. Jones, Lewisham, for Phloxes.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Mr. James Douglas, Bookham, for Carnations.
To Mr. Amos Perry, Enfield, for hardy flowers.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. May, Edmonton, for greenhouse plants.
To Mr. Miller, Wisbech, for hardy flowers.
To Rev. H. Pemberton, Havering-atte-Bower, for Roses.
To Messrs. Waterer & Crisp, Twyford, for hardy flowers.

Bronze Flora Medal.

To Mr. J. Box, Haywards Heath, for hardy flowers.
To Messrs. Bunyard, Maidstone, for hardy flowers.
To Mr. M. Prichard, Christchurch, for hardy flowers.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for hardy flowers.
To Mr. C. Elliott, Stevenage, for alpine plants.
To Mr. G. Reuthe, Keston, for miscellaneous plants.
To Messrs. Ware, Feltham, for hardy flowers.
To Mr. W. Wells, Merstham, for hardy flowers.

FIG. 103.—BEGONIA 'MRS. W. CUTHBERTSON.' (p. cxxvii.)

[*To face p.* cxxviii.

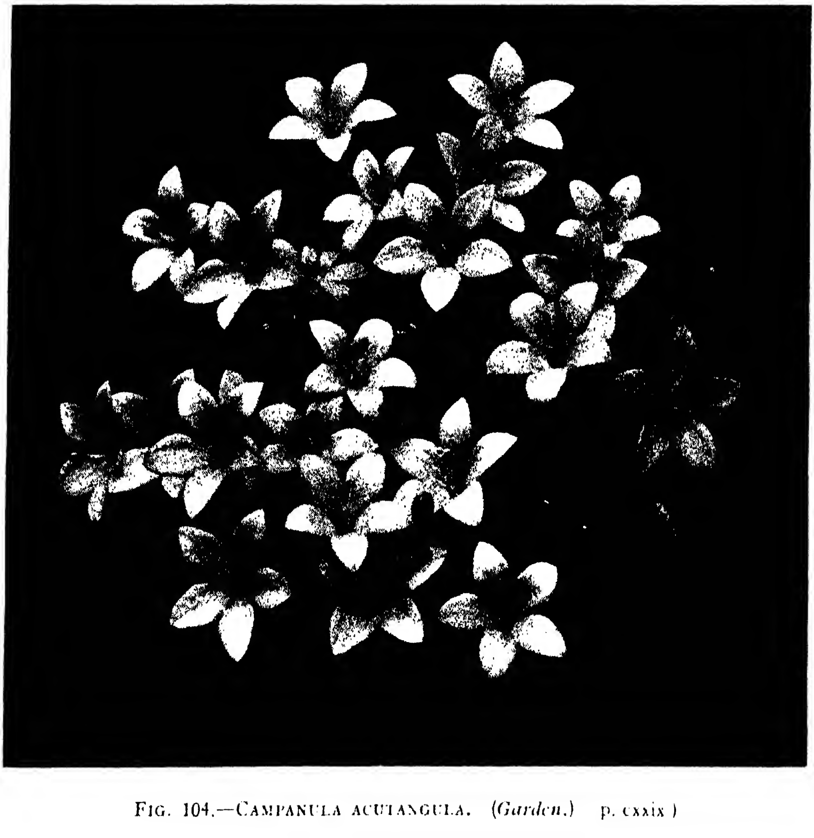


FIG. 104.—CAMPANULA ACUTANGULA. (*Garden.*) p. cxxix)

Award of Merit.

To *Campanula acutangula* (votes, unanimous), from Mr. M. Prichard, Christchurch. A species allied to *C. Portenschlagiana.* Height 3 inches, radical leaves angular, upper cordate, minute; flowers shallow with long, slightly recurved teeth, light purplish violet. Northern Spain. (Fig. 104.)

To *Campanula* × 'Meteor' (votes, unanimous), from Messrs. Grove, Sutton Coldfield. Plant about 10 inches high, flowers flat with revolute margins, white flushed on the back with blue. This variety bears a strong resemblance to *C.* × 'White Star' and arose from a self-fertilized seed of *C.* × 'Norman Grove' (see JOURNAL R.H.S. xl. p. cxc) (*C. Tommasiniana* × *C.* × 'White Star'). The generation which produced *C.* × 'Meteor' produced another seedling close to *C. Tommasiniana*, thus confirming the parentage of *C.* × 'Norman Grove.'

To *Pelargonium* 'Kathleen Bunyard' (votes, 12 for), from Mr. Billinghurst, Croydon. An ivy-leaf variety of bushy habit, flowers freely produced in large panicles, bright rosy-scarlet.

Other Exhibits.

Mr. Cæsar, Andover: *Pentstemon barbatus Millwayi.*

Mr. Campbell, Pannall: *Campanula* 'William Ferguson.'

Hon. Mrs. Fordham, Royston: *Anchusa italica* 'Opal.'

Mr. Hatten, Sudbury: *Lathyrus latifolius.*

Misses Hopkins, Shepperton: rock plants.

Mr. E. Jones, Didsbury: Viola 'Miss R. Halliday.'

Messrs. Paul, Cheshunt: Rose 'Silver Gem.'

Mr. Rose, Cardiff: Rose 'Druidstone Gem.'

Mr. Williams, Wolverhampton: Delphiniums.

Miss Willmott, V.M.H., Great Warley: *Anigozanthos coccinea* and *Plagianthus Lyallii* 'Warley variety.'

Messrs. Stuart Low, Bush Hill Park: Roses.

FLORAL COMMITTEE, AUGUST 4, 1913.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended:

Silver-gilt Flora Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), for scented Pelargoniums.

Silver-gilt Banksian Medal.

To Messrs. Jones, Lewisham, for Phloxes.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Mr. Allgrove, Slough, for Roses and *Thalictrum dipterocarpum.*

To Mr. Box, Lindfield, for Phloxes.

To Mr. Douglas, Bookham, for Border Carnations.

Silver Banksian Medal.

To Messrs. May, Edmonton, for greenhouse plants.

Bronze Banksian Medal.

To Messrs. Cutbush, Highgate, for Pelargoniums.
To Messrs. Stuart Low, Bush Hill Park, for greenhouse plants.
To Mr. Reuthe, Keston, for miscellaneous plants.
To Mr. W. Wells, jun., Merstham, for Phloxes.

Award of Merit.

To *Campanula* ' Abundance ' (votes, 10 for, 1 against), from Messrs. Grove, Sutton Coldfield. A seedling of *C.* ' Norman Grove,' resembling that variety except in its more vigorous, upright habit and larger, deeper-coloured flowers.

Cultural Commendation.

To *Tecoma grandiflora*, from H.R.H. The Duchess of Albany (gr. Mr. Kelly), Claremont, Esher.

To *Myrtus Luma*, from R. Cory, Esq. (gr. Mr. Cobb), Duffryn, Cardiff.

Other Exhibits.

Messrs. Dobbie, Edinburgh : Mignonette ' Crimson Queen.'
Mr. Elmer, Stonehouse : seedling Carnations.
Mr. Powell, Swaffham : seedling Carnations.
Mr. R. Prichard, West Moors : *Campanula* ' R. B. Loder.'
Messrs. Watson, Clontaff, Dublin : Carnation ' Soufré.'
J. B. B. Wellington, Esq., Elstree : Malmaison Carnation ' Mrs. Wellington.'
Messrs. Wells, Merstham : Carnation ' Roblin.'

Floral Committee, August 6, 1915.

Sub-Committee at Wisley.

Mr. H. B. May, V.M.H., in the Chair, and four members present.

A Sub-Committee inspected the Trial of Phloxes and made recommendations for awards, to be approved at the meeting of the full Committee.

Floral Committee, August 17, 1915.

Mr. H. B. May, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Flora Medal.

To Mr. J. Box, Lindfield, for Phloxes, &c.
To Messrs. Kelway, Langport, for Gladioli.
To Mr. J. Pigg, Royston, for Roses.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for hardy plants.
To Messrs. May, Edmonton, for greenhouse plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. Peed, West Norwood, for Begonias.
To Mr. Wells, Jun., Merstham, for Delphiniums.

Bronze Banksian Medal.

To Messrs. Cutbush, Highgate, for hardy plants.
To Mr. G. Reuthe, Keston, for miscellaneous plants.
To Messrs. Rich, Bath, for hardy plants.

Award of Merit.

To Dahlia 'Geraldine Edwards' (votes, unanimous), from Messrs. Stredwick, St. Leonards. A pale lilac cactus variety, of large size.

To Dahlia 'Patrol' (votes, 7 for, 3 against), from Messrs. Stredwick, St. Leonards. A Collerette variety, measuring about 4 inches in diameter. The colour is reddish-purple, becoming lighter at the tips of the florets. The collar is white.

To *Poterium obtusatum* (votes, 16 for), from Messrs. Barr, Taplow. A pretty species, producing an inflorescence about 2 ft. high. The bright rose colour of the filaments lends a pleasing glow of colour to the dense plumes of flowers.

The following awards were made to Herbaceous Phloxes after trial at Wisley (for descriptions see Report of Phloxes at Wisley, 1915, p. 250) :—

Award of Merit.

Antonin Mercié, Aubrey Alder, Espérance, Europe, Lady Grisel, La Neige, Météore, Selma.

Highly Commended.

Aegir, Arthur Ranc, Aurora, Baron von Dedem, Braga, Derviche, Distinction, Dr. Königshofer, Fort de France, Frau Grimm, General van Heutsz, Goliath, Helmuth Hirth, J. E. Suckling, Jules Sandeau, Lady Satanella, Lady Tate, Mrs. E. H. Jenkins, Pharaon, Rose Queen Seduction, Sergent Lovy, Sheriff Ivory, Viktor Stössel, Widar.

Commended.

Champignol, Daniel Lesueur, Flora Hornung, Joséphine Gerbaux, L'Aiglon, Marvel, Oculata, Reichsgraf von Hochberg, William Scott.

Other Exhibits.

Mr. Allgrove, Langley: hardy plants including *Thalictrum dipterocarpum.*

Messrs. Bath, Wisbech: Lobelias.

Misses Hopkins, Shepperton: rock plants.

Lady Leon, Bletchley: *Ornithogalum thyrsoides.*

Floral Committee, August 24, 1915.

Sub-Committee at Wisley.

Mr. H. B. May, V.M.H., in the Chair, and four members present.

A Sub-Committee inspected the Trial of Annual Sunflowers and made recommendations for awards, but it was subsequently decided to repeat the Trial next year.

Floral Committee, August 31, 1915.

Mr. H. B. May, V.M.H., in the Chair, and fifteen members present.

Awards Recommended :

Gold Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for trees and shrubs.

Silver-gilt Flora Medal.

To S. Morris, Esq., Earlham, for Montbretias.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for Dahlias and flowering shrubs.

Silver Banksian Medal.

To Messrs. May, Edmonton, for Bouvardias.

To Messrs. Peed, Norwood, for *Streptocarpus*.

Award of Merit.

To *Berberis Sargentiana* (votes, unanimous, from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A hardy, evergreen species, with reddish stems bearing relatively large leaves, some of which were bronze-tinted. Subtending the foliage-shoots are three large spines. The berries are said to be of a dull purple when ripe.

To *Cydonia Mallardii* (votes, unanimous), from the Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A new Chinese quince with narrow foliage. The fruits are numerous, lemon-shaped, and are borne close to the main stem. The plant exhibited was about 12 feet high and of distinct pyramidal shape.

To Dahlia 'Caprice' (votes, 5 for, 2 against), from Mr. C. Turner, Slough. A very distinct single variety. The florets are white, with a well-defined narrow band of claret colour along the margins.

To Dahlia 'Herald' (votes, 6 for, 1 against), from Messrs. Stredwick, St. Leonards. A large Collerette variety. The outer florets are magenta at the tips, reddish orange in the central parts, shading to gold at the base. The collar is white and gold.

To Dahlia 'Miss Judd' (votes, 7 for), from Messrs. Stredwick, St. Leonards. An exhibition Cactus variety with pale yellow florets having lighter tips.

FIG. 105.—NARCISSUS 'ALICE KNIGHTS.' (*Barr.*) (p. cxliii.)

[*To face p.* cxxxii.

FIG. 106.—NARCISSUS 'BATH'S FLAME.' (*Bath.*) (p. cxlv.)

To Dahlia 'Primrose Queen' (votes, unanimous), from Messrs. Cheal, Crawley. A pale lemon Collerette variety with a white collar.

To Dahlia 'Scarlet Queen' (votes, unanimous), from Messrs. Dobbie, Edinburgh. A well-formed Collerette variety of scarlet colour. The collar is gold-coloured.

To Dahlia 'Warneford' (votes, 9 for), from Mr. West, Brentwood. A good white decorative variety, of large size and excellent form.

To Dahlia 'Washington' (votes, 9 for), from Messrs. Stredwick, St. Leonards. A large, deep red Cactus variety, shaded with purple at the tips of the florets.

To Dahlia 'Yellow Star' (votes, 8 for, 1 against), from Messrs. Cheal, Crawley. A clear yellow variety of the new 'Star' type. The centre is orange-coloured.

To Eschscholzia 'The Geisha' (votes, 11 for, 3 against), from Messrs. Carter, Raynes Park. This variety is of distinct colouring, the exterior being bronzy-scarlet and the interior orange.

To Montbretia 'Queen Elizabeth' (votes, unanimous), from S. Morris, Esq. (gr. Mr. G. Henley), Norwich. A hybrid raised from 'George Henley' × 'Pageant.' The large, bold flowers are orange-red, with gold colour in the base of the tube.

Other Exhibits.

Messrs. Bunyard, Maidstone: *Anemone japonica* 'Kentish White.'
Messrs. Cutbush, Highgate: miscellaneous plants.
Misses Hopkins, Shepperton: rock plants.
Mr. J. A. Jarrett, Anerley: Dahlias.
Mrs. Martineau, Twyford: Dahlias.
Mr. G. W. Miller, Wisbech: hardy plants.
Mr. W. H. Moore, Epsom: Marguerite 'Miss Elsie Moore.'
Rev. J. H. Pemberton, Havering-atte-Bower: Roses.
Mr. G. Reuthe, Keston: hardy plants.
Messrs. Tucker, Oxford: *Chironia Fischeri.*
Mr. W. Wells, Jun., Merstham: hardy plants.

ORCHID COMMITTEE.

MAY 11, 1915.

Mr. J. GURNEY FOWLER in the Chair, and sixteen members present.

Awards Recommended :—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for a group.

Award of Merit.

To *Laeliocattleya* × 'Anaconda' (*L.-c.* × 'Pallas' × *C. Dowiana* 'Rosita') (votes unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Sepals and petals Indian yellow, with rose veining on the petals. Lip claret-red.

To *Laeliocattleya* × *Fascinator-Mossiae* var. 'Imogene' (*L.-c.* × *Fascinator alba* × *C. Mossiae Reineckiana*) (votes 12 for, 2 against), from Messrs. Flory and Black, Slough. Flower of good shape, white, with the front of the lip rose-purple, the disc yellow.

Cultural Commendation.

To Mr. J. E. Shill (gr. to Baron Bruno Schröder), for *Laeliocattleya* × 'Anaconda' with two spikes, each of three flowers.

Other Exhibits.

Mr. Jas. Hudson (gr. to Leopold de Rothschild, Esq.) : *Cattleya* × *Dusseldorfei* 'Undine.'
Walter Cobb, Esq. : *Cattleya Mossiae* 'Harlequin.'
R. G. Thwaites, Esq. : hybrid Odontoglossums.

CHELSEA SHOW, MAY 18, 1915.

Sir HARRY J. VEITCH in the Chair, and twenty-one members present.

[For cups and medals awarded by the Council after consultation with the Judges, see p. lxxxvi.]

Awards Recommended :—

First-class Certificate.

To *Cattleya* × 'Transylvania' ('Comet' var. 'Leonora' × 'Enid') (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). Flowers of good shape and very

distinct in colour. Sepals and petals purplish rose; lip claret-red, with fine gold lines from the base.

To *Odontioda* × *Colmaniae* (*Oda.* × *Bradshawiae* × *Odontoglossum* hybrid unrecorded) (votes unanimous), from Sir Jeremiah Colman, Bt., V.M.H., Gatton Park (gr. Mr. Collier). Flowers large and shaped like Odontoglossum, bright yellow, the greater part of the surface having deep red blotches.

Laeliocattleya × 'Sibyl' Low's variety (*L.-c.* × *Dominiana* × *Mendelii*) (votes unanimous), from Messrs. Stuart Low, Jarvisbrook, Sussex. The largest of its class and of fine shape. Sepals and petals rose, tinged and veined purple. Lip purplish crimson, with yellow and white disc.

Award of Merit.

To *Odontoglossum* × 'Princess Mary' (parentage unrecorded) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst (gr. Mr. J. Davis). One of the best hybrid Odontoglossums of the *O. eximium* class. Flowers white, with deep reddish-purple blotches. The spike bore seventeen flowers.

To *Odontoglossum crispum* 'Queen of the Belgians' (votes unanimous), from Messrs. Charlesworth, Haywards Heath. A seedling of the second generation of blotched *crispum*, of perfect shape, blush white, with dark purple blotches.

To *Miltonia* × *Hyeana* var. 'F. M. Ogilvie' (*M.* × *Bleuana Stevensii* × *vexillaria* 'Memoria G. D. Owen') (votes, 14 for, 0 against), from F. M. Ogilvie, Esq., Oxford (gr. Mr. Balmforth). Flower white, with violet tint at the base of the petals. Mask of lip deep ruby-red.

To *Laeliocattleya* × Helius' (*L.-c.* × 'G. S. Ball' × *C. Mossiae Wageneri*) (votes unanimous), from Messrs. McBean, Cooksbridge. A good yellow Cattleya with purple marking on the lip.

To *Odontoglossum* × 'Aglaon,' Orchidhurst variety (*Vuylstekeae* × *eximium*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Flowers large, white, heavily blotched with dark claret colour.

To *Laeliocattleya* × 'Gold Star' (*L.-c.* × 'Ariel' × *C. Mendelii*) (votes unanimous), from Messrs. Sander, St. Albans. Sepals and petals primrose yellow, front of lip dark purple.

To *Cattleya* × 'Tityus Rex' ('Octave Doin' × 'Enid') (votes unanimous), from Messrs. Flory & Black, Slough. A fine rose-tinted flower with ruby-red front to the lip, which has patches of yellow on each side of the tube.

To *Disa* × *Blackii* (*Luna* × *grandiflora*) (votes unanimous), from Messrs. Flory & Black. Flowers rose colour, with a slight red tinge.

To *Odontioda* × *Lambeauiana* 'Nellie' (*C. Noezliana* × *Odm.* × *Lambeauianum*) (votes unanimous), from Messrs. Flory & Black. A pretty rose-red flower, of good shape.

ORCHID COMMITTEE, JUNE 8, 1915.

Mr. J. GURNEY FOWLER in the Chair, and eighteen members present.

Awards Recommended :—

Silver Flora Medal.

To J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis), for white forms of *Cattleya Mossiae* and new hybrid Odontoglossums.

To William Thompson, Esq., Walton Grange, Stone, Staff. (gr. Mr. J. Howes), for Odontoglossums.

To Messrs. Sander, St. Albans, for species and hybrids.

To Messrs. Charlesworth, Haywards Heath, for hybrid Miltonias.

To Messrs. Cypher, Cheltenham, for Cattleyas, Laeliocattleyas, &c.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for Odontoglossums, Odontiodas, &c.

To Messrs. Stuart Low, Jarvisbrook, for a group including forms of *Cattleya Mendelii.*

To Messrs. Hassall, Southgate, for a group.

First-class Certificate.

To *Odontoglossum* × 'Princess Mary' (parentage unrecorded) (votes unanimous), from J. Gurney Fowler, Esq. (gr. Mr. J. Davis). The plant shown at Chelsea, May 18, and an **A.M.** recorded for it in error.

To *Odontoglossum* × 'Menier' var. 'St. Vincent' (*gandavense* × *amabile*) (votes unanimous), from J. Gurney Fowler, Esq. A superb Odontoglossum with flowers having the inner two-thirds of the segments finely marked with claret colour, the outer parts being white, tinged with rose.

To *Cypripedium Curtisii Sanderae* (votes unanimous) from Messrs. Sander, St. Albans. A very remarkable albino, of the same nature as *C. callosum Sanderae,* and the first to appear in the many large importations of this fine old species. Sepals and petals white, with emerald green lines on the bases. Lip primrose colour, tinged with green.

Award of Merit.

To *Odontoglossum crispum* 'Perfect Gem' (votes 14 for, 0 against), from W. Thompson, Esq., Walton Grange. Flowers white, with a cluster of light purple blotches on each segment. The plant has been shown as *O.* × 'Perfect Gem,' but the Committee considered it to be a form of *O. crispum.*

Other Exhibits.

Sir Jeremiah Colman, Bt., V.M.H.: *Odontoglossum crispum* 'Queen of Gatton.'

R. G. Thwaites, Esq.: White Cattleyas.

Messrs. Flory & Black : hybrids.
H. S. Goodson, Esq. : Odontiodas and Odontoglossums.
E. R. Ashton, Esq. : *Miltonia Charlesworthii.*

ORCHID COMMITTEE, JUNE 22, 1915.

Sir HARRY J. VEITCH in the Chair, and fifteen members present.

Awards Recommended :—

Silver Banksian Medal.

To William Thompson, Esq., Walton Grange, Stone, for a selection of hybrid Odontoglossums.

To Messrs. Stuart Low, Jarvisbrook, for a group.

Award of Merit.

To *Laeliocattleya* × *Canhamiana*, Fowler's variety (*L. purpurata atropurpurea* × *C. Mossiae*) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). A fine dark variety. Sepals and petals rosy lilac ; lip dark purple.

To *Odontioda* × ' Red Cross ' (*Oda.* × *Cooksoniae* × *Odm.* × *ardentissimum*) (votes 10 for, 0 against), from J. Gurney Fowler, Esq. A bright red flower with irregular white margin and white front to the lip.

Other Exhibits.

J. Gurney Fowler, Esq. : rare Orchids.
R. G. Thwaites, Esq. : hybrids.
Sir Jeremiah Colman, Bt. : Odontiodas &c.
Messrs. Sander : *Laeliocattleya* × *Gottoiana Imperator.*

ORCHID COMMITTEE, HOLLAND HOUSE, JULY 6, 1915.

Sir HARRY J. VEITCH in the Chair, and twenty-one members present.

[For cups and medals awarded by the Council after consultation with the Judges see p. xcvi.]

Awards Recommended :—

Lindley Medal.

To J. Gurney Fowler, Esq., Brackenhurst, Pembury, Tunbridge Wells (gr. Mr. J. Davis) for a noble specimen of *Odontoglossum* × *Georgius Rex* with a fine spike of twenty-eight flowers.

First-class Certificate.

To *Odontoglossum* × *Georgius Rex* (parentage unrecorded) (votes unanimous), from J. Gurney Fowler, Esq. Flowers four and a half inches across, white, heavily blotched with dark claret-purple. The plant received an **A.M.** May 20, 1913.

To *Cattleya Warscewiczii* ' Mrs. E. Ashworth ' (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Flowers blush-pink, slightly darker on the front of the lip, which has a pale yellow disc.

Award of Merit.

To *Laeliocattleya* × *Fascinator-Mossiae* var. ' Moonlight ' (*L.-c.* × *Fascinator* × *C. Mossiae*) (votes unanimous), from Messrs. Charlesworth. A pretty albino, the flowers being white, without trace of the colour of the parents.

To *Cattleya Mendelii* ' Mrs. Smee ' (votes unanimous), from Sir Jeremiah Colman, Bt., V.M.H. (gr. Mr. Collier). A beautiful variety with white flowers having a tinge of lilac colour. Lip crimson, with orange disc.

To *Cattleya* × ' Paula ' (× *Clarkiae* × *Dowiana aurea*) (votes unanimous), from Messrs. McBean, Cooksbridge. Sepals and petals pale rose, tinged with yellow; lip deep maroon, with gold lines from the base.

Other Exhibits.

Elizabeth Lady Lawrence: varieties of *Cypripedium Stonei.*

Pantia Ralli, Esq.: *Cattleya* hybrid.

Orchid Committee, July 20, 1915.

Sir Harry J. Veitch in the Chair, and twelve members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Messrs. Stuart Low, Jarvisbrook, for *Aerides odoratum album* and other Indian Orchids.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for Odontoglossums, Odontiodas, &c.

Award of Merit.

To *Bulbophyllum Balfourianum* n. sp. (votes unanimous), from Messrs. Sander. A very remarkable species said to have been imported from New Guinea, and in growth, substance, and colour of the flowers a near ally of *B. Fletcherianum* (**A.M.** May 5, 1914), but with the flowers narrower and the lateral sepals much longer.

B. Balfourianum has glaucous green pseudo-bulbs, which have a wrinkled or granulated surface. The fleshy lanceolate leaves, six to eight inches long and two wide, are whitish green, with a narrow rose margin. The inflorescence is a short raceme borne close to the pseudo-bulbs. The sepals are 1½ inch long and about 1 inch wide, the lateral two curved and approached, connate for part of their

length, but with the tips free and diverging. The ground colour is cream-white, the inner parts deep claret colour, the outer spotted with the same tint. Lip tinged, reddish claret. The flowers resemble some Stapelias in substance, tint, and odour.

Other Exhibits.

J. Gurney Fowler, Esq.: *Cymbidium aloifolium* variety.
Miss Violet B. Fellowes: *Liparis plantaginea.*
Messrs. Flory & Black: hybrids.
Messrs. E. H. Davidson: *Cattleya superba alba.*

Orchid Committee, August 4, 1915.

Mr. J. Gurney Fowler in the Chair, and eleven members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums, &c.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Messrs. Stuart Low, Jarvisbrook, for a group.

First-class Certificate.

To *Cattleya* × 'Sybil' var. 'Scintillant' (*Dowiana aurea* × *iridescens*) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). A very distinct hybrid with light rose sepals and petals tinged with yellow, and ruby-red lip with orange-coloured base.

Award of Merit.

To *Laeliocattleya* × 'Thyone,' Fowler's variety (*L.-c.* × 'Ophir' × *C. Dowiana aurea*) (votes unanimous), from J. Gurney Fowler, Esq. Sepals and petals cowslip yellow; lip deep claret colour, with fine gold lines from the base.

Cattleya × 'Harold,' Fowler's variety (*Gaskelliana alba* × *Warscewiczii* 'Frau Melanie Beyrodt') (votes 7 for, 2 against), from J. Gurney Fowler, Esq. Flowers white, with a purple blotch in front of the yellow disc of the lip.

Other Exhibits.

J. Gurney Fowler, Esq.: new hybrids.
E. G. Mocatta, Esq.: *Laeliocattleya.*
H. T. Pitt, Esq.: Cattleyas.
Messrs. Flory & Black: Odontoglossums.

Orchid Committee, August 17, 1915.

Sir Harry J. Veitch in the Chair, and seventeen members present.

Awards Recommended :—

Silver Flora Medal.

To J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis), for rare Orchids.

To Messrs. Charlesworth, Haywards Heath, for a group.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group.

First-class Certificate.

To *Odontoglossum* × 'President Poincaré' (parentage unrecorded) (votes unanimous), from J. Gurney Fowler, Esq. A very large flower with remarkably broad segments, which are light purple, with distinct pale lilac blotches at the tips.

To *Odontonia* × *Charlesworthii*, Fowler's variety (*M. vexillaria* × *O. Uro-Skinneri*) (votes unanimous), from J. Gurney Fowler, Esq. Sepals and petals indicating the *O. Uro-Skinneri*, and blotched with dark red-brown. Lip arranged as in *M. vexillaria*, deep rosy mauve with some white mottling, and a ruby-red band round the yellow crest.

To *Cattleya* × *Hardyana* 'His Majesty' (*Dowiana aurea* × *Warscewiczii*) (votes unanimous), from Messrs. Stuart Low, Jarvisbrook. A very fine dark form with large claret-purple lip.

Award of Merit.

To *Cattleya* × 'Sybil' *rotundobella* (*Dowiana aurea* × *iridescens*) (votes unanimous), from J. Gurney Fowler, Esq. This form, compared with the variety, 'Scintillant,' which gained a **F.C.C.** August 4, shows the extreme variation in seedlings from the same batch, the former variety having the narrow lip of *C. bicolor*, one of the parents of *C.* × *iridescens*, and the present variety the rounded labellum of *C. Eldorado*, the other parent. Colour yellow with a rose shade, the front of the lip light crimson, the throat orange.

To *Cattleya* × *Drapsiana vinosa* (× 'Mrs. Pitt' × *Dowiana aurea*) (votes unanimous), from J. Gurney Fowler, Esq. Flowers dark purple, with orange centre to the lip.

Other Exhibits.

Sir Herbert Leon : *Cypripedium* × 'Transvaal.'

C. J. Lucas, Esq. : *Cypripedium* × 'Warnham Fairy.'

Mrs. Bischoffsheim : *Laeliocattleya* × 'Rubens,' Warren House variety.

Messrs. Flory & Black : hybrids.

Messrs. Hassall : forms of *Cattleya* × 'Sybil.'

FIG. 107.—NARCISSUS 'CHRYSE.' (p. cxlv.)

[*To face p.* cxl.

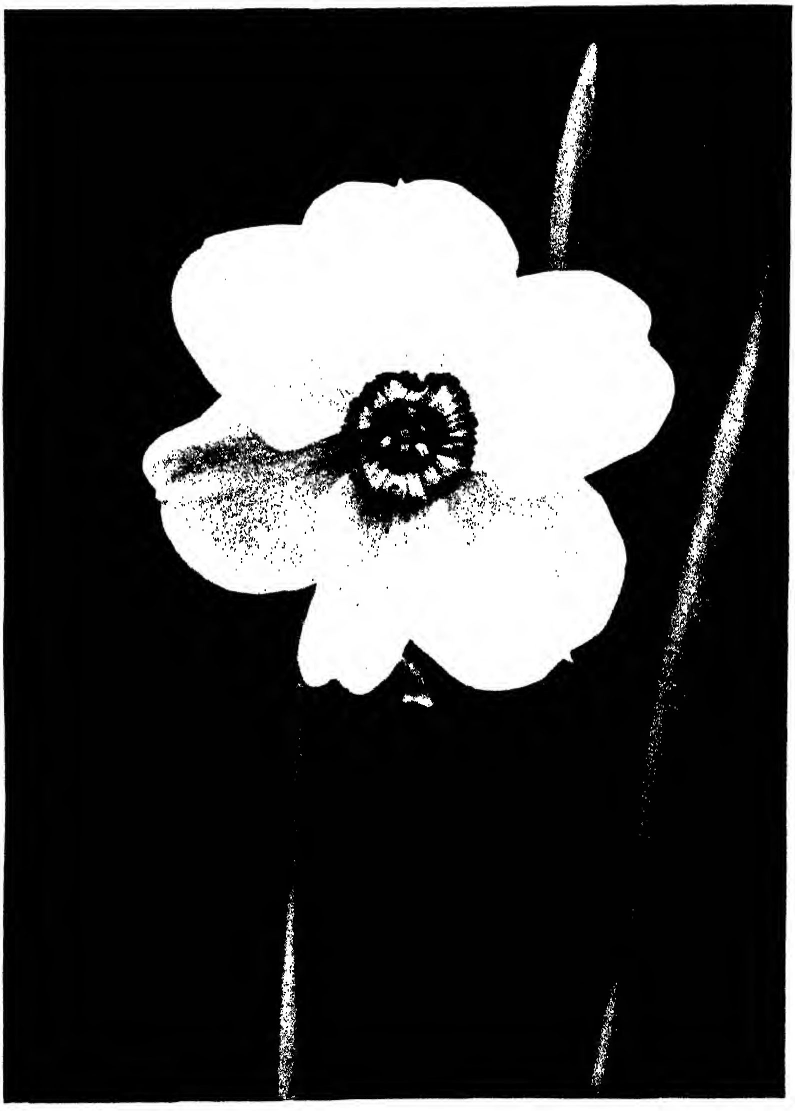


FIG. 108.—NARCISSUS POETICUS 'CÆDMON.' (p. cxlv.)

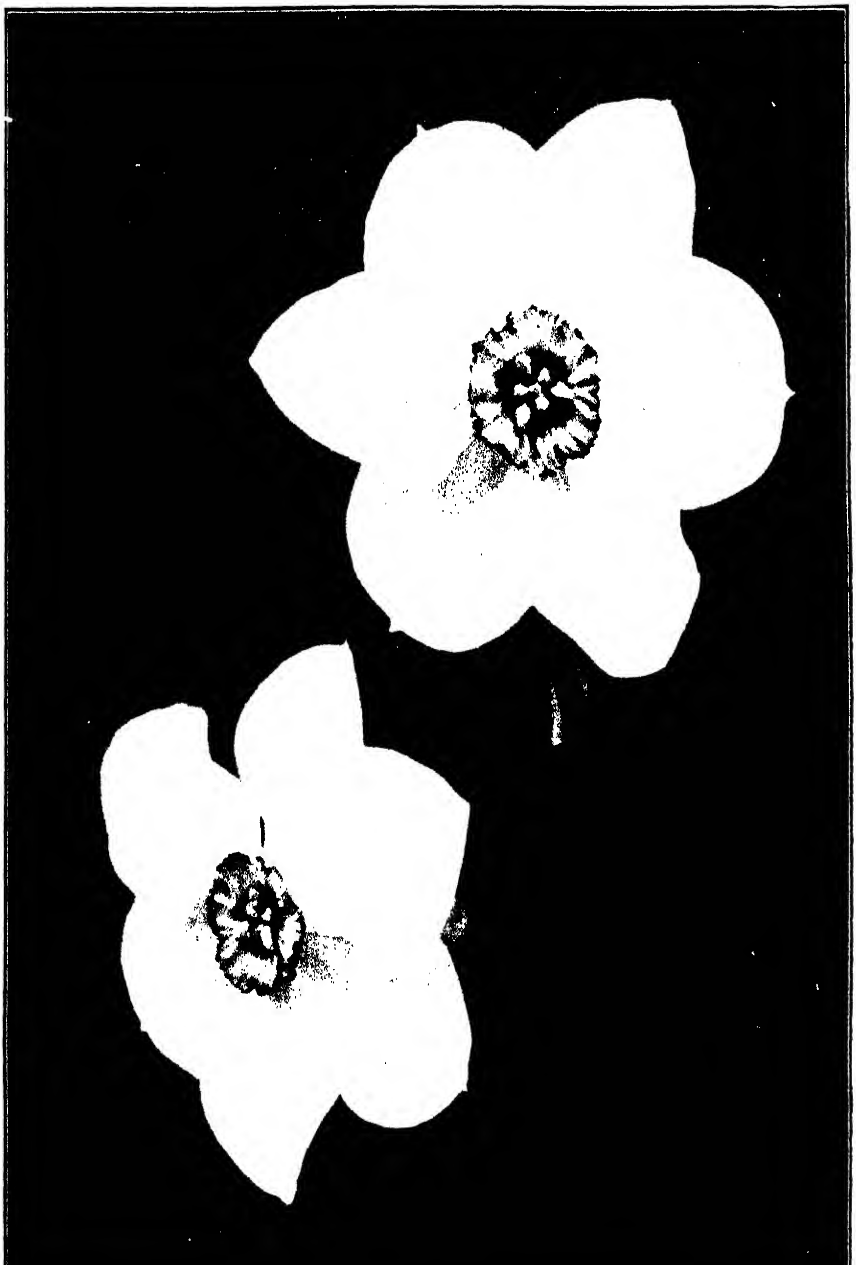


FIG. 109.—NARCISSUS 'MARSEILLAISE.' (*Chapman.*) (p. cxlv.)

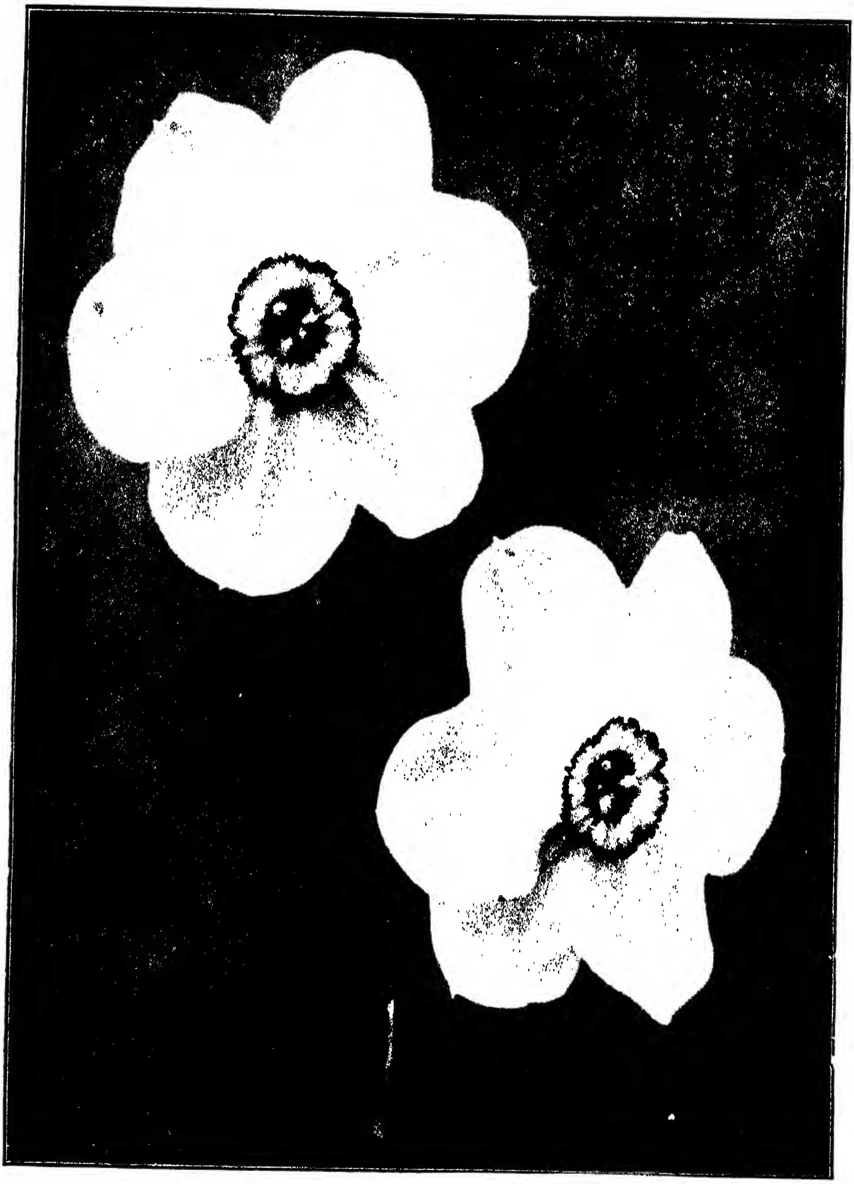


FIG. 110.—NARCISSUS 'DISTICH.' (*Chapman.*) (p. cxlv.)

[*To face p.* cxli.

Orchid Committee, August 31, 1915.

Mr. J. Gurney Fowler in the Chair, and sixteen members present.

Awards Recommended :—

Silver Flora Medal.

To J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis), for hybrids.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for a group.

First-class Certificate.

To *Catasetum Bungerothii* (*pileatum*) 'Mrs. Tom Fielden' var. (votes unanimous), from Sir Jeremiah Colman, Bt., V.M.H., Gatton Park (gr. Mr. Collier). Flowers large, white, with a green blotch at the base of the lip.

To *Sophrocattleya* × 'Sylvia' (*S.-c.* × 'Doris' × *C. Hardyana*) (votes unanimous), from J. Gurney Fowler, Esq. Flowers intense vinous purple, with ruby-crimson shade on the lip. The darkest in colour yet shown.

To *Cattleya* × 'Sybil' var. 'Georgius V. Rex' (*Dowiana aurea* × *iridescens*) (votes unanimous), from W. R. Lee, Esq., Plumpton Hall, Heywood. Similar in form to the variety shown August 17 as var. *rotundobella*. Sepals and petals cowslip-yellow, tinged with bronzy rose; lip ruby-red with gold veining at the base.

Award of Merit.

To *Laeliocattleya* × *eximia delicatissima* (*L. purpurata* × *C. Warneri*) (votes unanimous), from J. Gurney Fowler, Esq. A large flower of perfect shape, white, with the sides of the front lobe purple.

To *Cattleya* × *Hardyana alba*, Fowler's variety (votes unanimous), from J. Gurney Fowler, Esq. The largest of the white-petalled forms, having a bright rose-purple lip with yellow disc.

Other Exhibits.

Lieut.-Col. Warrender : *Cattleya* × *Clarkiae*.
R. G. Thwaites, Esq. : hybrid Odontoglossums.
Messrs. Hassall : varieties of *Cattleya* × 'Sybil.'
Messrs. Flory & Black : Brassocattleyas.

NARCISSUS AND TULIP COMMITTEE.

MARCH 2, 1915.

Mr. WILLIAM POUPART in the Chair, and six members present.

The question of arranging a definite scheme of measurements for the classification of Daffodils was raised by the Rev. J. Jacob, who was requested to bring the matter before the Committee at the following meeting.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Cuthbert, Southgate, N., for Tulips.

Silver Banksian Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.

NARCISSUS AND TULIP COMMITTEE, MARCH 9, 1915.

Rev. G. H. ENGLEHEART, V.M.H., in the Chair, and twelve members present.

On the motion of Messrs. J. Jacob and F. H. Chapman, the action of the Committee on March 2, when a quorum could not be formed, was endorsed.

The Rev. J. Jacob brought forward a scheme for a uniform system of measuring Daffodils for purposes of classification. This was seconded by Mr. Herbert Smith, but, after some discussion, "the previous question" was moved and carried.

The Rev. J. Jacob having announced the intention of the Council not to publish a "Daffodil Year Book" in 1915, Messrs. W. T. Ware and R. Wallace moved, and it was unanimously agreed, that the following resolution be sent to the Council :—"That this Committee regrets to hear 'The Daffodil Year Book' will not be published this year, and very earnestly requests the Council to reconsider its decision, and publish a Year Book as usual, even if in a modified form" (p. cxliii).

The subject of Registration of Daffodil names was brought forward, and subsequently referred for consideration to a Sub-Committee consisting of Messrs. Leak, Barr, and Jacob.

On the motion of Messrs. J. Jacob and C. L. Adams it was agreed that the lists of Daffodils suitable for special purposes be revised, and that the honorary secretary prepare and send round the necessary voting papers (see p. cxlvii).

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. C. Bourne, Bletchley, for Daffodils.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for Daffodils.
To Messrs. Cuthbert, Southgate, N., for Tulips.

NARCISSUS AND TULIP COMMITTEE, MARCH 16, 1915.

Mr. E. A. BOWLES in the Chair, and eleven members present.

The report of the Sub-Committee concerning the Registration of Daffodil names was presented, and, after considerable discussion, the Rev. J. Jacob proposed, Mr. P. R. Barr seconded, and it was unanimously agreed to recommend the following regulation to the Council:—"That no *Narcissus* name will in future be accepted by the Royal Horticultural Society's Narcissus Committee unless such name is accompanied by a fee of *2s. 6d.*"

It was also agreed, following on the former resolution, to recommend further—"That when a *Narcissus* is entered for registration, a form similar to the one used for entry for award must be filled in and sent to the Honorary Secretary of the Committee."

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Pearson, Lowdham, for Daffodils.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for Daffodils.
To Messrs. Waterer, Sons, & Crisp, Bagshot, for Tulips.
To Messrs. Bath, Wisbech, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'Alice Knights,' for pots (votes, 7 for, 0 against), from Messrs. Barr, Covent Garden. A white trumpet variety that received an **A.M.** on April 11, 1905. (Fig. 105.)

NARCISSUS AND TULIP COMMITTEE, MARCH 30, 1915.

Mr. E. A. BOWLES in the Chair, and twelve members present.

The honorary secretary reported that the Council had agreed to the publication of a "Daffodil Year Book," as usual.

Mr. C. L. Adams brought forward a motion for the subdivision of the *Leedsii* Daffodils in the R.H.S. Classification. The Rev. Canon Fowler seconded the motion as a recommendation to the Classification Sub-Committee, and it was agreed, on Mr. Adams' suggestion, that the proposals be sent to each member of Committee and the matter finally considered at the meeting of April 13.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Barr, Covent Garden, for Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Bath, Wisbech, for Tulips and Daffodils.

NARCISSUS AND TULIP COMMITTEE, APRIL 13, 1915.

Mr. E. A. BOWLES in the Chair, and twenty members present.

The honorary secretary reported that the Council had adopted the recommendation of the Committee respecting the Registration of Daffodil names, adding "that a name so registered should hold good for five years, but would be free at the end of that period unless, meanwhile, the variety had been exhibited at a meeting of the Royal Horticultural Society." Some discussion took place concerning the time limit imposed by the Council, but eventually it was accepted unanimously, and the matters of registration form, receipt, &c., were left in the hands of the Chairman and Honorary Secretary.

In accordance with the notice of motion, Mr. C. Lemesle Adams and Canon Fowler brought forward the following resolution, copies of which had already been sent to members of Committee :—

"That the Classification of Daffodils be amended as follows: In Division IV., the words 'embracing all dimensions as found in the *Incomparabilis* and *Barrii* groups, Divisions II. and II.,' be deleted and in place thereof the following be substituted:

"(*a*) Cup or crown not less than one-third, but less than equal to the length of the perianth segments.

"(*b*) Cup or crown less than one-third the length of the perianth segments."

Upon the advice of the Chairman this was accepted as a recommendation to the Classification Sub-Committee and adopted unanimously.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Bath, Wisbech, for Tulips.

To Messrs. Barr, Covent Garden, for Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Bath, Wisbech, for Daffodils.

Silver Flora Medal.

To Mr. C. Bourne, Bletchley, for Daffodils.

Silver Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Tulips.

Award of Merit.

To *Narcissus* 'Bath's Flame' (votes, 16 for, 0 against), for market and garden purposes, from Messrs. Bath, Wisbech. (Fig. 106.)

To *Narcissus* 'Chryse' (votes, 18 for, 0 against), for show purposes, from Messrs. Cartwright & Goodwin, Kidderminster. A Jonquil hybrid of the cupped type and of a very deep shade of yellow Corona widely expanded and with a wide scalloped edge. (Fig. 107.)

NARCISSUS AND TULIP COMMITTEE, APRIL 27, 1915.

Mr. E. A. BOWLES in the Chair, and twenty members present.

The ballot for the Peter Barr Memorial Cup took place, and as a result of the voting the Chairman declared Mr. P. D. Williams, St. Keverne, the holder of the Cup for the ensuing year.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, Covent Garden, for Daffodils, the group including many new seedlings.

Silver-gilt Flora Medal.

To Messrs. Pearson, Lowdham, for Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Herbert Chapman, Rye, for Daffodils, mostly seedlings of their own raising.

To A. J. Nix, Esq., Crawley, for Daffodils.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.

Silver Flora Medal.

To Mr. C. Bourne, Bletchley, for Daffodils.

To Mr. A. M. Wilson, Shovel, for new Daffodils.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for Daffodils.

First-class Certificate.

To *Narcissus* 'Cædmon' (votes, 12 for, 0 against), for show purposes, from Messrs. Barr, Covent Garden. A fine *Poeticus* variety with a pronounced red rim to its cup and distinctly clawed segments. It gained an **A.M.** on April 15, 1913. (Fig 108.)

Award of Merit.

To *Narcissus* 'Mary Copeland' (votes, 9 for, 2 against), for show purposes, from Mr. W. Copeland, Shirley, Southampton. A shapely and symmetrical double. Perianth segments flat and even, the split-up corona with pleasing little bits of colour between them.

To *Narcissus* 'Marseillaise' (votes, 9 for, 4 against), for show purposes, from Messrs. Herbert Chapman, Rye. Somewhat like 'Almira.' Perianth waved, of good substance, and very symmetrical. Eye pale lemon yellow with a narrow edge of red. A *Poeticus* variety. (Fig. 109.)

To *Narcissus* 'Distich' (votes, 12 for, 2 against), for show purposes, from Messrs. Herbert Chapman. A *Poeticus* variety with a broad rim

to the eye. Perianth flat, imbricated, and at first distinctly yellow toned. (Fig. 110.)

To *Narcissus* 'White King' (votes, unanimous), for show purposes, from Rev. J. Jacob, Whitchurch. A giant *Leedsii*. Perianth very flat, imbricated and pointed. Cup expanding, pale primrose.

Narcissus and Tulip Committee, May 11, 1915.

Mr. E. A. Bowles, in the Chair, and eleven members present.

On the motion of the Rev. J. Jacob and Mr. J. D. Pearson it was unanimously agreed to recommend the Schedule Sub-Committee to include a Class or Classes for small Daffodils in the Schedule for the Exhibition of 1916.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, Covent Garden, for Tulips.

Silver-gilt Banksian Medal.

To Messrs. Bath, Wisbech, for Tulips.

Silver Flora Medal.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for Tulips.

Silver Banksian Medal.

To Messrs. Cuthbert, Southgate, for Tulips.

To Messrs. Robert Sydenham, Birmingham, for Tulips.

Award of Merit.

To Tulip 'Marconi' (votes, 11 for, 0 against), from Messrs. Waterer, Sons, & Crisp, Bagshot. A fine Darwin variety; rich purple-maroon, with the bases of the segments marked with white on the outside.

To Tulip 'Empire' (votes, 11 for, 0 against), from Messrs. W. T. Ware, Bath. A globular-flowered Cottage variety, with pointed segments; glowing Indian yellow.

To Tulip 'Nirvana' (votes, 8 for, 0 against), from Messrs. W. T. Ware. A beautiful Cottage Tulip; rosy mauve tipped with bronze, the bases of the segments shaded with blue and yellow.

To Tulip 'Winner' (votes, 11 for, 0 against), from Messrs. W. T. Ware. A large globular variety; shaded pink and white, with a white blue-starred base.

Subsequently, the Classification Sub-Committee accepted the recommendation for the subdivision of the *Leedsii* group of *Narcissus*, and checked the voting for select Daffodils suitable for various purposes.

The Schedule Sub-Committee, also acting on the Committee's recommendation, prepared several Classes for small Daffodils, for the Schedule of the R.H.S. Daffodil Show of 1916.

LIST OF DAFFODILS SUITABLE FOR VARIOUS PURPOSES.

THE following lists of varieties for the purposes mentioned have been selected by the Daffodil Committee of the R.H.S., June 1915.

BEST TWENTY-FOUR FOR THE GARDEN.

1. *Barrii conspicuus.*
2. Lucifer.
3. Madame de Graaff.
4. Empress.
5. White Lady.
6. Emperor.
7. Sir Watkin.
8. Argent.
9. Lady Margaret Boscawen.
10. Autocrat.
11. Blackwell.
12. Gloria Mundi.
13. Seagull.
14. Fairy Queen.
15. Horace.
16. King Alfred.
17. *poeticus recurvus.*
18. Weardale Perfection.
19. Beauty.
20. Bernardino.
21. Beauty.
22. Cassandra.
23. Duke of Bedford.
24. Stella superba.

BEST TWENTY-FOUR FOR POT CULTIVATION.

1. Victoria.
2. Firebrand.
3. Madame de Graaff.
4. Weardale Perfection.
5. Blackwell.
6. Queen of Spain.
7. Sir Watkin.
8. W. P. Milner.
9. Emperor.
10. Golden Spur.
11. *obvallaris.*
12. Aspasia.
13. Empress.
14. Fairy Queen.
15. Henry Irving.
16. King Alfred.
17. Seagull.
18. Lucifer.
19. Cassandra.
20. Elvira.
21. Evangeline.
22. Jaune à Merveille.
23. *poeticus ornatus.*
24. White Lady.

BEST TWENTY-FOUR FOR CUTTING.

1. *Barrii conspicuus.*
2. Sir Watkin.
3. Empress.
4. Lucifer.
5. Argent.
6. Emperor.
7. Frank Miles.
8. King Alfred.
9. White Lady.
10. Blackwell.
11. Golden Spur.
12. Horace.
13. Madame de Graaff.
14. Weardale Perfection.
15. Albatross.
16. Lady Margaret Boscawen.
17. Seagull.
18. Evangeline.
19. Fairy Queen.
20. *poeticus ornatus.*
21. Aspasia.
22. Elvira.
23. Henry Irving.
24. *poeticus recurvus.*

Best Twenty-four for Rock Gardens.

1. *minimus.*
2. Queen of Spain.
3. W. P. Milner.
4. *Bulbocodium citrinus.*
5. *cyclamineus.*
6. *triandrus albus.*
7. *juncifolius.*
8. *triandrus calathinus.*
9. *capax plenus.*
10. *gracilis.*
11. *minor.*
12. *moschatus.*
13. *nanus.*
14. *Bulbocodium conspicuus.*
15. Eoster.
16. *Macleayii.*
17. J. T. Bennett-Poë.
18. *pallidus praecox.*
19. *Jonquilla.*
20. Lulworth.
21. Minicycla.
22. Mountain Maid.
23. *tenuior.*
24. *triandrus concolor.*

ESTABLISHED 1804.

INCORPORATED 1809.

TELEGRAMS: "HORTENSIA SOWEST LONDON"

TELEPHONE: VICTORIA 5363.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. General.
2. Letters.
3. Journals Wanted.
4. Subscriptions.
5. Form of Bequest.
6. New Fellows.
7. An Appeal.
8. R.H.S. Gardeners' Diary.
9. The Society's Gardens at Wisley.
10. Rock Garden at Wisley.
11. Students at Wisley.
12. Distribution of Surplus Plants.
13. Spring and Summer Shows.
14. National Diploma in Horticulture.
15. Examinations, 1916.
16. Information.
17. Inspection of Fellows' Gardens.
18. Affiliation of Local Societies.
19. Rules for Judging—1914 Code.
20. Rules for Judging Cottage and Allotment Gardens.
21. R.H.S. Daffodil Year Book.
22. R.H.S. Publications.
23. R.H.S. Pamphlets.
24. Trials at Wisley, 1916.
25. Shirley Poppies.
26. Advertisements.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W., except those specially connected with Wisley, which should be addressed—The Director, R.H.S. Gardens, Wisley, Ripley, Surrey.

3. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted :—

Vols. I. to VI.	Vol. XIII. Part 1.
Vol. X.	Vol. XIV.

These are, therefore, particularly asked for.

4. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year ; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription ; if elected after the 1st of October and before the 1st of January, he pays one year's subscription, and no further subscription until January twelvemonth. To avoid the inconvenience of remembering their subscriptions Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments ; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society ; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

5. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £.........., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

6. NEW FELLOWS.

The increasing number of Fellows shows plainly the useful work the Society is doing, and its value to all lovers of the Garden. The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as it is now more important than ever to fill the places of those who are taken from us.

7. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Help towards the Wisley Endowment.
3. Providing Lectures with Lantern Slides.
4. Presenting Books for the Library at Vincent Square and at Wisley.
5. Sending new or rare Plants and Seeds for the Garden, Sedums and Mossy Saxifrages for nomenclature purposes, and surplus Roots for distribution to the Fellows.

8. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1916 contains a considerable quantity of new information, and is compiled more especially for the single-handed gardener. Fellows may obtain it post free, 1*s.* 2½*d.*, from the R.H.S. Office, Vincent Square, London, S.W.; or 2*s.* 2½*d.* if leather-bound.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to make up this sum?

9. THE SOCIETY'S GARDENS AT WISLEY.

The increasing enjoyment and instruction which Fellows derive from the Gardens is indicated by the fact that the number of Fellows visiting Wisley has been greater this year than in any previous year.

The work in hand, which includes the making of a fernery to contain the collection presented by Mr. W. B. Cranfield, and the formation of a large pond in the seven-acre field, is making good progress. Both this work and the building of the Laboratory, which should have been completed during the present year, has been delayed. It is hoped that it will be ready for the accommodation of the staff early in the coming year.

Of the present staff and past and present students upwards of sixty-three have joined His Majesty's forces. Mr. Harold Page, Chemist on the Wisley Staff, is still at the Front, and Professor Lefroy, who held the post of entomologist, has undertaken, at the urgent request of the Secretary of State, an important inquiry in India. Inasmuch as this inquiry involved a year's absence from England the Council was compelled, with great reluctance, to accept the resignation which Professor Lefroy tendered on accepting the appointment.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*; or to and from Horsley, or Byfleet, 7*s.* Motor cars will be found at Byfleet Station, 7*s.* 6*d.* the return journey. Accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy, Ockham.

10. ROCK GARDEN AT WISLEY.

In response to the interest taken in what are popularly called "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take

away an idea of how best to do this or that, or where best to plant this or that.

An Alpine House has been built above the Rock Garden, for the purpose of growing rock plants to perfection which blossom too early to withstand our wet winters and late spring frosts.

11. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

12. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded ; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants ? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small,* and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the " Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot ; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all

Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

13. SPRING AND SUMMER SHOWS.

The Great Spring Show will be held at the Royal Hospital Gardens, Chelsea, in May 1916. The general arrangements will be similar to those of past years. The Summer Show will be held at Holland House, Kensington, in July 1916.

14. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners will welcome the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for by the consent of H.M. Government, the Department of Agriculture consented to cooperate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations, which are held in June, are practical, viva voce, and written. The practical part is held in a suitable garden.

Information may be obtained by sending a directed envelope bearing a *2d.* stamp to the Secretary, Royal Horticultural Society, Vincent Square, S.W.

15. EXAMINATIONS, 1916.

N.B.—The syllabus of the Examinations may be obtained from the Secretary, R. H. Hall, Vincent Square, S.W., post free 2½*d*.

1. The Annual General Examination in the Principles and Practice of Horticulture will be held on March 8, 1916. It has two divisions, viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Copies of the Questions set from 1893 to 1915 (price 2*s*. 2½*d*. post free) may also be had. The Society is willing to hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Worshipful Company of Gardeners, to be awarded after the 1916 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad if approved by the Council of the Society. In case of two or more candidates being equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 12, 1916. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any other test of such competence. The conduct of this Examination is on similar lines to that of the General Examination. Questions on Elementary Chemistry and Biology are included.

Medals and Certificates are awarded, and Class Lists published, in connexion with these Examinations.

16. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

17. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3*s*. for one day (or £5 5*s*. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner*.

18. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.; no fewer than 330 Societies have joined our ranks.

Secretaries can obtain a specimen Card for the use of Affiliated Societies for Certificates, Commendations, &c. Price, including postage, 4*s*. for 10 copies, 6*s*. for 20, 12*s*. for 50, 21*s*. for 100. At the request of several of the Societies, the Council have had the Card coloured. The coloured Card is sold at 1*s*. a single copy, or 10 for 6*s*., post free.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s*. 9*d*., with case complete; Silver, 12*s*. 9*d*., with case complete; Silver-gilt, 16*s*. 9*d*., with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 9*d*. each.

19. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s*. 9*d*., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

20. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment Holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at threepence a copy, or fifty for 8*s*.

A companion Judges' Sheet in a very convenient book-like form can also be had for 2s. 6d. a dozen. This Judges' Sheet has, in tabulated form, a list of the plants usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given.

21. R.H.S. DAFFODIL YEAR BOOK.

The Daffodil Year Books of the Society are amongst the most interesting works on gardening. The first issue (1913) was sold out within a month of publication. Of the 1914 issue but few copies remain unsold. The 1915 Year Book has 144 pages (with 33 illustrations) of clear, reliable information, and it makes quite pleasant reading.

It can be obtained from Messrs. Wesley, 28 Essex Street, Strand, London, W.C., price 3s. post free.

22. R.H.S. PUBLICATIONS.

In future, Fellows can obtain the Society's publications only from the R.H.S. Office, Vincent Square, S.W. Non-Fellows should order direct from Messrs. Wesley, 28 Essex Street, Strand, W.C., who have been appointed Agents for the Society.

23. R.H.S. PAMPHLETS.

The following pamphlets can be ordered or obtained from the R.H.S. Office, Vincent Square, London, S.W. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. The prices of *each* are as follows:—Single Copy, 3*d.*; 25, 5*s.* 6*d.*; 50, 8*s.* 6*d.*; 100, 15*s.*:—

(1) A selected List of Hardy Fruits for all Gardens and of Small Fruits for Cottage and Allotment Gardens (1916 edition, revised).
(2) The Training of Fruit Trees.
(3) Vegetables and How to Grow Them in Small Gardens and Allotments.
(4) Flowers for Small Gardens, Window Boxes, and Wall Decorations.
(5) Hardy and Half-Hardy Annuals in the Open Air.
(6) Bottling Fruits.
(7) Vegetable Cookery.
(8) Salads and Salad Making.
(9) The Growing of Vegetables from August-sown seeds.

24. TRIALS AT WISLEY, 1916.

The following new trials will take place at Wisley in 1916 (subject to sufficient labour being available) :—

Flowers.

"Annual" Carnations and Indian Pinks: one packet of each variety to be sent by January 31.

Clarkias: one packet of each variety to be sent by January 31.

Godetias: one packet of each variety to be sent by January 31.

Larkspurs or annual Delphiniums: one packet of each variety to be sent by January 31.

Mignonette: one packet of each variety to be sent by January 31.

Annual Sunflowers: 20 seeds of each variety to be sent by January 31.

Delphiniums (perennial): 3 plants of each variety to be sent by February 29.

Mossy Saxifrages (for nomenclature): 3 plants of each variety to be sent by February 29.

The collection of Sedums for nomenclature purposes is being maintained, and Fellows will greatly oblige by adding to it (see p. 328).

Vegetables and Fruits.

Celeriac: one packet of each variety to be sent by January 31.

Celery: one packet of each variety to be sent by January 31.

Midseason Peas: ½ pint of each variety to be sent by January 31.

Late Potatos: 20 tubers of each variety to be sent by January 31.

Savoys: one packet of each variety to be sent by January 31.

Tomatos under glass: one packet of each variety to be sent by January 31.

Sundries.

Fungicides for Rose Mildew: quantity sufficient for a fair trial to be sent by March 30.

Powder Sprayers: one specimen of each to be sent by March 30.

Preparation for Future Trials.

The following are also desired to be sent in during 1916 :—

Hollyhocks: one packet of each to be sent by February 29.

Stocks, biennial and winter-flowering: one packet of each to be sent by April 30.

Onions: one packet of each to be sent by May 31.

Raspberries, autumn-fruiting: 3 plants of each variety to be sent by November 15.

Raspberries, summer-fruiting: 3 plants of each to be sent by November 15.

The necessary entry forms may be obtained on application from The Director, R.H.S. Gardens, Wisley, Ripley, Surrey, and materials for trial should be sent to the same address. (Station for goods: Horsley, L. & S.W. Railway.)

25. SHIRLEY POPPIES.

The Rev. W. Wilks will be pleased to send a packet of his 1915 crop of seed to any Fellow who likes to send him, to *The Wilderness, Shirley, Croydon*, a stamped envelope ready addressed to himself. The stock this year is but small. Applicants receiving no reply within a few days may conclude that the supply is exhausted. This offer is made by the Secretary in his private capacity, and no attention can be paid to any requests for seed unless sent as directed above.

26. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

CHEMICAL PRIVILEGES OF FELLOWS.

ANALYSES.

Applicable only to those Fellows who are not engaged in any Horticultural Trade, or in the manufacture or sale of any substance sent for Analysis.

The Council have fixed the following rates of Charges for Chemical Analysis to Fellows of the Society being *bona fide* Gardeners or Amateurs.

These privileges are applicable only when the Analyses are for *bona fide* horticultural purposes, and are required by Fellows for their own use and guidance in respect of gardens or orchards in their own occupation.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Fellow applying for them, and must not be used for the information of other persons, or for commercial purposes.

Gardeners when forwarding samples are required to state the name of the Fellow on whose behalf they apply.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

When applying for an analysis, Fellows must be very particular to quote the number in the following schedule under which they wish it to be made :—

No.		
1.	An opinion on the purity of bone-dust (each sample)	2*s*. 6*d*.
2.	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5*s*.
3.	An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10*s*.
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5*s*.
5.	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime and ammonia, together with an opinion as to whether it be worth the price charged	10*s*.
6.	An analysis of bone-dust, basic slag, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10*s*.
7.	Determination of potash in potash salts, compound manures, &c.	7*s*. 6*d*.
8.	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10*s*. to £1
9.	An analysis of limestone, showing the proportion of lime	7*s*. 6*d*.
10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	£1
11.	Complete analysis of a soil	£3
12.	Analysis of any vegetable product	10*s*.
13.	Determination of the "hardness" of a sample of water before and after boiling	5*s*.
14.	Analysis of water used for domestic purposes	£1 10*s*.
15.	Consultation by letter	5*s*.

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. AUGUSTUS VOELCKER, M.A., F.I.C., No. 1 Tudor Street, New Bridge Street, London, E.C.

The fees for analyses must be sent to the Consulting Chemist at the time of application.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

SEPTEMBER 14, 1915.

Dr. FREDERICK KEEBLE, F.R.S., in the Chair.

Fellows elected (4).—W. K. Baker, Miss L. Pearson, C. Van den Berg, Miss E. M. Winter.

Fellow resident abroad (1).—W. Cowper Harris (Vancouver).

A lecture on "Dahlias" was given by Mr. J. B. Riding (see p. 411).

THE CORY CUP FOR DAHLIAS.

TUESDAY, SEPTEMBER 14.

THE JUDGES.

Cory, Reginald, Duffryn, Cardiff.
Cuthbertson, W., V.M.H., Maitland Lodge, Duddingston.
May, H. B., V.M.H., The Plas, Chingford.
Riding, J. B., The Nurseries, Chingford.
Turner, A., Royal Nurseries, Slough.

This Cup is given solely with the object of encouraging raisers to produce Dahlias, of any class or section, that would be of Decorative value in the garden.

The competition was open. Twenty-five feet run of 3 feet tabling, not built up more than 8 feet in height from the ground level to the top of the flowers, was allowed.

First Prize: Seventy-five Guinea Challenge Cup, presented to the R.H.S. by Reginald Cory, Esq.—To Messrs. W. Treseder, Cardiff.

Silver-gilt Flora Medal.—To Messrs. Carter Page, 52 London Wall.

Silver-gilt Banksian Medal.—To Messrs. J. Cheal, Crawley, Sussex.

GENERAL MEETING.

SEPTEMBER 28, 1915.

The Rev. W. WILKS, M.A., V.M.H., in the Chair.

Fellows elected (19).—J. Bartlett, H. D. Benton, Hon. Alice Byron, B. A. Carr, T. W. E. Davenall, Mrs. E. H. Fenn, Miss A. Griffith, J. W. Horseman, F. W. Hunt, C. H. Jones, H. Jones, B.A., F.R.G.S., Mrs. C. W. Kennaway, A. G. Kephala, Dr. T. J. Lane, R.N., Mrs. L. Mond, Miss V. M. L. Speer, Miss Steele, A. J. Stephens, A. J. Ward.

Fellows resident abroad (3).—Mrs. L. M. Langridge (British East Africa), J. A. Marshall (Calcutta), C. E. Wood (Tonga Islands).

Associates (2).—Miss A. Landau, Miss M. Landau.

A lecture on "Early-flowering Chrysanthemums" was given by Mr. Robert Fife (see p. 426).

SIXTH ANNUAL EXHIBITION OF VEGETABLES.

HELD IN THE SOCIETY'S HALL, VINCENT SQUARE, S.W.,
SEPTEMBER 28, 1915.

THE JUDGES.

Bates, W., Cross Deep Gardens, Twickenham.
Curtis, C. H., Adelaide Road, Brentford.
Cuthbertson, W., V.M.H., Maitland Lodge, Duddingston.
Dickson, J., Woodside Gardens, Chenies, Rickmansworth.
Fielder, C. R., V.M.H., Great Warley, Brentwood, Essex.
Grubb, A., Porter's Park, Shenley.
Ireland, A., Mark's Tey, Essex.
Molyneux, E., V.M.H., Swanmore Park Gardens, Bishops Waltham.
Pearson, A. H., J.P., V.M.H., The Hut, Lowdham, Notts.
Pope, W., Welford Park Gardens, Newbury.
Senn, C. H., 329 Vauxhall Bridge Road, S.W.
Thomas, O., V.M.H., 25 Waldeck Road, West Ealing.
Willard, J., Reigate.

OFFICIAL PRIZE LIST.

THIS EXHIBITION WAS OPEN TO AMATEURS ONLY.

The Owner's name and address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.

Collections.

N.B.—A competitor could enter in only one of the first three Classes. Arrangement was taken into consideration by the Judges.

Class 1.—Twelve kinds distinct selected from the following: Beet, Brussels Sprouts, Cabbage, Broccoli or Cauliflower, Carrot, Celery, Cucumber, Endive, Leek, Lettuce, Mushroom, Onion, Parsnip,

Pea, Potato, Tomato, Turnip, Bean (Runner or French), Vegetable Marrow.

First Prize, The Sutton Challenge Cup (value £21) and £10 ; Second, £5 ; Third, £3 ; Fourth, £2.

1. Hon. Vicary Gibbs, Aldenham House, Elstree (gr. Mr. E. Beckett).
2. T. Jones, Esq., Bryn Penylan, Ruabon, Wales.
3. Sir Daniel Gooch, Hylands, Chelmsford (gr. W. Heath).

Class 2.—Nine kinds distinct, to be selected from the list in Class 1.

Mr. Gibbs won the Sutton Challenge Cup in 1913 and was ineligible to receive it this year. A Standard Cup was awarded. The Sutton Cup was not awarded.

First Prize, £5 ; Second, £3 ; Third, £2 ; Fourth, £1.

1. W. H. Myers, Esq., Swanmore Park, Bishops Waltham (gr. G. Ellwood).
2. Lord North, Wroxton Abbey, Oxon. (gr. E. R. Janes).
3. Col. R. Knox, Holt Hatch, Alton, Hants (gr. W. West).
4. E. E. Palmer, Esq., Drayton House, Sherfield, Basingstoke (gr. J. R. Wallis).

Class 3.—Six kinds distinct, to be selected from the list in Class 1. Number of specimens as stated.

First Prize, £3 ; Second, £2 5s. ; Third, £1 10s. ; Fourth, 15s.

1. Miss Bradshaw, The Grange, Steeple Aston (gr. R. Wadham).
2. Rev. J. Davies, Crowle Vicarage, Worcester.
3. G. Thorn, Esq., Sprotlands, Willesboro', Ashford (gr. M. Hoad).

Class 4.—Potatos, collection of twelve varieties distinct.

First Prize, £3 ; Second, £2 ; Third, £1.

1. G. Thorn, Esq.
2. Rev. M. McMurdie, Weybridge (gr. A. Basile).

Class 5.—Potatos, collection of six varieties distinct.

First Prize, £1 10s. ; Second, £1 ; Third, 10s.

1. F. L. Pike, Esq., Serge Hill, King's Langley.
2. D. W. Bedford, Esq., The Braes, Berkhamsted.
3. Mrs. Smart, Llansannan, Abergele (gr. Mr. R. Rogers).

Class 6.—Onions, collection of six varieties distinct, as follows :—

2 dishes of the 'Ailsa Craig' type, one oval and the other round.
1 dish of Red Onions.
1 dish of Silverskins.
1 dish of James', or other long-keeping brown globe Onions.
1 dish of White Spanish or Nuneham Park type (flat, not globe).

N.B.—More than 2 dishes of selections of Ailsa Craig type, or varieties indistinguishable from it, will disqualify.

First Prize, £2; Second, £1; Third, 10s.

1. Hon. Vicary Gibbs.
2. Mr. R. Staward, The Gardens, Panshanger.
3. Mrs. Jenner, Wenvoe Castle, nr. Cardiff (gr. H. Wheeler).

Class 7.—Salads, collection of nine kinds distinct, each kind to be staged separately.

First Prize, £3 10s.; Second, £2 10s.; Third, £1 5s.

1. Hon. Vicary Gibbs.
2. F. Bibby, Esq., Hardwicke Grange, Shrewsbury (gr. J. Taylor).

Competitors in Class 7 cannot enter in Class 8.

Class 8.—Salads, collection of six kinds distinct, each kind to be staged separately.

First Prize, £2 5s.; Second, £1 10s.; Third, 15s.

1. Lord North.
2. W. H. Myers, Esq.
3. E. E. Palmer, Esq.

Class 9.—Other Vegetables, six kinds distinct, to be selected from the following:—Cardoon, Capsicum or Chili, Celeriac, *Stachys tuberifera*, Seakale, Egg Plant, Jerusalem Artichoke, Salsify, Scorzonera, Kohl Rabi, Couve Tronchuda.

First Prize, £2 10s.; Second, £1 10s.; Third, 15s.

1. Hon. Vicary Gibbs.
2. Lord North.

Single Dish Classes.

In Classes 10–40 the First Prize is in each case 10s.; the Second, 7s. 6d.; Third, 5s. The specimens shown in each Class must be always of one and the same variety.

Class 10.—Beans, Scarlet Runners.

1. Mrs. Jenner.
2. Hon. Vicary Gibbs.
3. F. L. Pike, Esq.

Class 11.—Beans, French Climbers.

1. Col. R. Knox.
2. Mr. R. Staward.
3. Sir Montagu Turner, Bedfords, Havering (gr. A. Humphrey).

Class 12.—Beans, French Dwarf.

1. Col. R. Knox.
2. Hon. Vicary Gibbs.
3. H. Keep, Esq., Aldermaston, Reading.

Class 13.—Beet, Globe type.
1. F. Bibby, Esq.
2. Col. R. Knox.
3. D. W. Bedford, Esq.

Class 14.—Beet, Long type.
1. Lord North.
2. Hon. Vicary Gibbs.
3. Rev. J. Davies.

Class 15.—Brussels Sprouts, 50 buttons.
1. Hon. Vicary Gibbs.
2. W. H. Myers, Esq.
3. Mrs. Jenner.

Class 16.—Brussels Sprouts, three plants.
1. Hon. Vicary Gibbs.
2. Mr. R. Staward.
3. Col. R. Knox.

Class 17.—Cabbage.
1. Sir Daniel Gooch.
2. T. Jones, Esq.

Class 18.—Cabbage, Savoy.
1. Hon. Vicary Gibbs.
2. E. E. Palmer, Esq.
3. Sir Francis Lloyd, Aston, Oswestry (gr. W. Y. Staward).

Class 19.—Cauliflower or Broccoli.
1. W. H. Myers, Esq.
2. Hon. Vicary Gibbs.
3. T. Jones, Esq.

Class 20.—Celeriac.
1. Mr. R. Staward.
2. Lord North.
3. S. G. Skelton, Esq., Sudbury Croft, Harrow (gr. A. Wilkinson).

Class 21.—Celery, White.
1. E. E. Palmer, Esq.
2. Lord North.
3. F. Bibby, Esq.

Class 22.—Celery, Red.
1. Lord North.
2. T. Jones, Esq.
3. Hon. Vicary Gibbs.

Class 23.—Cucumbers.
1. W. H. Myers, Esq.
2. Hon. Vicary Gibbs.
3. Miss E. L. Bradshaw.

Class 24.—Leeks.
1. Hon. Vicary Gibbs.
2. Mr. R. Staward.
3. Sir Francis Lloyd.

Class 25.—Marrows.
1. Miss E. L. Bradshaw.
2. W. H. Myers, Esq.
3. Mr. R. Staward.

Class 26.—Mushrooms.
1. Hon. Vicary Gibbs.
No other awards.

Class 27.—Onions.
1. E. E. Palmer, Esq.
2. Mrs. Jenner.
3. Mr. R. Staward.

Class 28.—Parsnips.
1. Lord North.
2. E. E. Palmer, Esq.
3. S. G. Skelton, Esq.

Class 29.—Carrots, Long.
1. Hon. Vicary Gibbs.
2. Lord North.
3. F. L. Pike, Esq.

Class 30.—Carrots, Stump-rooted or Short.
1. Hon. Vicary Gibbs.
2. Mrs. Jenner.
3. T. Jones, Esq.

Class 31.—Peas.
1. Lord North.
2. D. W. Bedford, Esq.
3. Rev. J. Davies.

Class 32.—Turnips, White Skin and Flesh.
1. Rev. M. McMurdie.
2. D. W. Bedford, Esq.
3. F. L. Pike, Esq.

Class 33.—Turnips, Purple-top, Red-top, or Green-top, Flesh White.
1. Hon. Vicary Gibbs.
2. F. L. Pike, Esq.
3. F. Bibby, Esq.

Class 34.—Turnips, Yellow Flesh.
1. F. L. Pike, Esq.
2. Mrs. Jenner.
3. Hon. Vicary Gibbs.

Class 35.—Potatos, White.

1. D. W. Bedford, Esq.
2. Mrs. Smart.
3. Lord North.

Class 36.—Potatos, Coloured.

1. Rev. T. McMurdie.
2. Hon. Vicary Gibbs.
3. Sir Montagu Turner.

Class 37.—Kale, Curled.

1. Mr. R. Staward.
2. T. Jones, Esq.
3. Hon. Vicary Gibbs.

Class 38.—Tomatos, Red.

1. F. Bibby, Esq.
2. Hon. Vicary Gibbs.
3. Sir Daniel Gooch, Bt.

Class 39.—Tomatos, Yellow.

1. Hon. Vicary Gibbs.
2. Mr. R. Staward.
3. Sir Francis Lloyd.

Class 40.—Any other Vegetable not named in the Schedule.

1. Lord North.
2. Hon. Vicary Gibbs.
3. Miss E. L. Bradshaw.

CHAMPION CHALLENGE CUP.

A Champion Cup will be held for one year (subject to a guarantee of its return in good condition) by the winner of the greatest number of First Prize points throughout the whole Exhibition, the winner in Class 1 being excluded. An Exhibitor may win this cup only once in three years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative Cup. In calculating for this Champion Cup the number of points reckoned for each First Prize will be as follows :

Class 2	9 points each
Classes 3, 4, 7	6 ,, ,,
Classes 5, 6, 8, 9	4 ,, ,,
All other Classes	1 point ,,

Challenge Cup.—Hon. Vicary Gibbs.

Standard Cup.—W. H. Myers, Esq.

NINETEENTH ANNUAL EXHIBITION OF BRITISH-GROWN FRUIT.

HELD AT THE SOCIETY'S HALL, VINCENT SQUARE, S.W., OCTOBER 5 AND 6, 1915.

THE JUDGES.

Allan, A. R., Hillingdon Court Gardens, Uxbridge.
Bacon, W. H., Mote Park Gardens, Maidstone.

Barnes, N. F., Eaton Hall Gardens, Chester.
Basham, J., Bassaleg, Newport, Mon.
Bates, W., Cross Deep Gardens, Twickenham.
Beckett, E., V.M.H., Aldenham House Gardens, Elstree.
Bunyard, E. A., F.L.S., Royal Nurseries, Maidstone.
Challis, T., V.M.H., Wilton House Gardens, Salisbury.
Cheal, A., Lowfield Heath, Crawley, Sussex.
Coomber, T., V.M.H., The Hendre Gardens, Monmouth.
Cornford, J., Quex Park Gardens, Birchington.
Crump, W., V.M.H., Madresfield Court Gardens, Malvern.
Divers, W. H., V.M.H., Belvoir Castle Gardens, Grantham.
Earp, W., Bayham Abbey Gardens, Lamberhurst.
Fielder, C. R., V.M.H., Warley Street, Great Warley, Brentwood.
Goodacre, J. H., V.M.H., Elvaston Castle Gardens, Derby.
Grubb, A., Porter's Park Gardens, Shenley, Herts.
Harriss, E., Lockinge Gardens, Wantage.
Mackellar, A., V.M.H., Royal Gardens, Windsor.
Markham, H., Wrotham Park Gardens, High Barnet.
Molyneux, E., V.M.H., Swanmore Park Gardens, Bishops Waltham.
Mortimer, S., Rowledge, Farnham, Surrey.
Paul, G., V.M.H., J.P., Cheshunt, Herts.
Pope, W., Welford Park Gardens, Newbury.
Poupart, W., Marsh Farm, Twickenham.
Reynolds, G., Gunnersbury Park Gardens, Acton, W.
Rivers, H. S., Sawbridgeworth.
Smith, A. C., Hatchford Park Farm, Cobham, Surrey.
Smith, J. R., Bedgebury Park Gardens, Goudhurst, Kent.
Turton, T., Sherborne Castle Gardens, Dorset.
Veitch, P. C. M., J.P., New North Road, Exeter.
Vert, J., Chirk Castle Gardens, Ruabon.
Ward, A., Godinton Gardens, Ashford, Kent.
Weston, J. G., Eastwell Park Gardens, Ashford, Kent.
Whittle, J., Cheveney Gardens, Hunton, Kent.
Woodward, G., Barham Court Gardens, Teston, Maidstone.

THE REFEREES.

Hudson, J., V.M.H., Gunnersbury House Gardens, Acton, W.
Metcalfe, A. W., Luton Hoo Gardens, Beds.
Pearson, A. H., V.M.H., Lowdham, Notts.
Rollit, Sir Albert K., St. Ann's Hill, Chertsey.
Thomas, O., V.M.H., 25 Waldeck Road, West Ealing.

OFFICIAL PRIZE LIST.

The Owner's name and address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.

DIVISION I.

Fruits Grown under Glass or Otherwise.

OPEN TO GARDENERS AND AMATEURS ONLY.

Note.—Exhibitors can compete in one Class only of Classes 1, 2, and of Classes 3, 4.

Class 1.—Collection of nine dishes of ripe dessert fruit: 6 kinds at least; only 1 Pine, 1 Melon, 1 Black and 1 White Grape, allowed; not more than two varieties of any other kind, and no two dishes of the same variety.

First Prize, Silver Cup and £5; Second, £5; Third, £3.

1. Duke of Newcastle, Clumber, Worksop (gr. S. Barker).
2. Lord Somers, Eastnor Castle, Ledbury (gr. G. Mullins).
3. Lord Hillingdon, The Wilderness, Sevenoaks (gr. J. Shelton).

Class 2.—Collection of six dishes of ripe dessert fruit: 4 kinds at least; only 1 Melon, 1 Black and 1 White Grape, allowed; not more than two varieties of any other kind, and no two dishes of the same variety. Pines excluded.

First Prize, Silver Cup and £3; Second, £3; Third, £2.

1. C. A. Cain, Esq., The Node, Welwyn (gr. T. Pateman).
2. Major St. Maur, Stover Park, Newton Abbot (gr. H. Richardson).
3. Major Powell Cotton, Quex Park, Birchington (gr. J. Cornford).

Class 3.—Grapes, six distinct varieties (2 bunches of each), of which two at least must be White.

First Prize, Silver Cup and £6; Second, £6; Third, £4.

1. Duke of Newcastle.
2. Lord Hillingdon.

No third.

Class 4.—Grapes, four varieties (2 bunches of each), selected from the following: 'Madresfield Court,' 'Prince of Wales.' 'Muscat Hamburgh,' 'Muscat of Alexandria' or 'Canon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg.'

First Prize, Silver Cup and £3; Second, £3; Third, £2.

1. C. A. Cain, Esq.

No other awards.

Class 5.—Grapes, Black Hamburgh, 2 bunches.

First Prize, £2; Second, £1 10s.; Third, £1.

1. Lord Hillingdon.
2. B. E. Richardson, Esq., Hill House, Stanstead Abbots (gr. E. Coleman).

No third.

Class 6.—Grapes, 'Mrs. Pince,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Duke of Newcastle.
2. G. Miller, Esq., Newberries, Radlett (gr. J. Kidd).
3. Major St. Maur.

Class 7.—Grapes, 'Alicante,' 2 bunches.

First Prize, £2 ; Second, £1 10s. ; Third, £1.

1. Mrs. W. Raphael, Castle Hill, Englefield Green (gr. H. H. Brown).
2. Lord Somers.
3. G. Miller, Esq.

Class 8.—Grapes, 'Madresfield Court,' 2 bunches.

First Prize, £2 ; Second, £1 10s. ; Third, £1.

1. Marquis of Salisbury, Hatfield House, Herts (gr. H. Prime).
2. Lord Hillingdon.
3. Duke of Newcastle.

Class 9.—Grapes, 'Prince of Wales,' 2 bunches.

First Prize, £2 ; Second, £1 10s. ; Third, £1.

1. Sir Walpole Greenwell, Marden Park, Surrey (gr. W. Lintott).
2. G. Mayer, Esq., Wistler's Road, Woldingham.
3. Sir Montagu Turner, 'Bedfords, Havering, Essex (gr. A. Humphrey).

Class 10.—Grapes, any other other Black Grape, 2 bunches. (The name of the variety must be stated on both the Entry Form and the label.)

First Prize, £2 ; Second, £1 10s. ; Third, £1.

1. Duke of Newcastle.
2. Viscountess Enfield, Wrotham Park, Barnet (gr. H. Markham).
3. G. Miller, Esq.

Class 11.—Grapes, 'Muscat of Alexandria,' 2 bunches.

First Prize, Silver Knightian Medal and £2 ; Second, £2 ; Third, £1 10s.

1. Duke of Newcastle.
2. C. A. Cain, Esq.
3. G. Miller, Esq.

Class 12.—Grapes, any other White Grape, 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. C. A. Cain, Esq.
2. G. Miller, Esq.

Class 13.—Collection of Hardy Fruits, in a space not exceeding 12 × 3.

Thirty dishes distinct, grown entirely in the open, including not more than 12 varieties of Apples and eight of Pears.

First Prize, Silver Cup and £2 ; Second, £2 ; Third, £1 10*s.*

1. F. Bibby, Esq., Hardwicke Grange, Shrewsbury (gr. J. Taylor).
2. Lord Somers.
3. Major Powell-Cotton.

DIVISION II.

FOR FRUIT GROWN ENTIRELY OUT OF DOORS.

OPEN TO NURSERYMEN ONLY.

Nurserymen and Market Growers exhibit as individuals or as firms. *They must have actually grown all they exhibit.* Combinations of individuals or firms are not allowed, nor the collection of produce from different districts.

Class 14.—30 feet run of 6 feet tabling.

Gold Medal.—J. C. Allgrove, Langley, Slough.
Gold Medal.—Messrs. George Bunyard, Maidstone.
Gold Medal.—Messrs. Cannell, Eynsford, Kent.
Silver-gilt Knightian.—Messrs. J. Cheal, Crawley, Sussex.
Silver Knightian.—Messrs. Seabrook, Chelmsford.

Class 15.—20 feet run by 6 feet tabling.

Silver-gilt Knightian.—R. C. Notcutt, Woodbridge.
Silver-gilt Banksian.—Barnham Nurseries, Barnham, Sussex.
Silver Knightian.—Messrs. S. Spooner, Hounslow.

Class 16.—12 feet run of 6 feet tabling.

Silver-gilt Banksian.—Chas. Turner, Royal Nurseries, Slough.
Silver Knightian.—Messrs. G. Cooling, Bath.

For Orchard-house grown fruit, and Trees in pots.

Class 17.—24 feet by 6 feet of stage. Grapes excluded.
Gold Medal.—King's Acre Nurseries, Hereford.

DIVISION III.

OPEN TO MARKET GROWERS ONLY.

An Exhibitor may show in one only of the Classes 18 and 19.

Nurserymen and Market Growers exhibit as individuals or as firms. *They must have actually grown all they exhibit.* Combinations of individuals or firms are not allowed, nor the collection of produce from different districts.

Class 18.—Apples, 20 baskets of (cooking and dessert, distinct).

Fruit suitable for market purposes will have more consideration than a large number of varieties.

Standard Silver Cup.—Messrs. Gaskain & Whiting, Dargate, Faversham.

Class 19.—Apples, 12 baskets of (6 cooking and 6 dessert, distinct).

Fruiterers' Company Silver-gilt Medal.—H. Lumley Webb, Ham Green, Upchurch.

Silver-gilt Knightian.—Horticultural College, Swanley.

Silver Knightian.—Lt.-Col. Lumley Webb, Callam Hills, Sittingbourne.

Class 20.—Pears, 6 baskets of, distinct.

The size of the baskets to be limited to half-bushels if round, to grape (baby baskets if rectangular.

Silver Knightian.—Messrs. Gaskain & Whiting.

DIVISION IV.

FRUITS GROWN ENTIRELY IN THE OPEN AIR.

OPEN TO GARDENERS AND AMATEURS ONLY.

Exhibitors of Apples or Pears in Division IV. were excluded from Division VI.

N.B.—Exhibitors can compete in one class only of the Classes 21, 22, 23 or 26, 27, 28.

Class 21.—Apples, 24 dishes distinct, 16 cooking, 8 dessert. The latter to be placed in the front row.

First Prize, Silver Cup and £3; Second, £4; Third, £3.

1. C. A. Cain, Esq.
2. Lord Somers.
3. Dr. Jackson, Brigstock Road, Thornton Heath, Surrey (gr. W. Paully).

Class 22.—Apples, 18 dishes distinct, 12 cooking, 6 dessert. The latter to be placed in the front row.

First Prize, Silver Knightian Medal and £3; Second, £2; Third, £1.

1. Earl of Lytton, Knebworth House, Stevenage (gr. H. Brotherston).

No other awards.

Class 23.—Apples, 12 dishes distinct, 8 cooking, 4 dessert. The latter to be placed in the front row.

First Prize, Fruiterers' Company Silver Medal and £2; Second, £1; Third, 15*s*.

1. J. Liddell, Esq., Sherfield Manor, Basingstoke (gr. R. Learmouth).
2. G. Miller, Esq.

No third.

Class 24.—Cooking Apples, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. C. A. Cain, Esq.
2. J. Liddell, Esq.

Class 25.—Dessert Apples, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. Lord Somers.
2. J. Liddell, Esq.

Class 26.—Dessert Pears, 18 dishes distinct.

First Prize, Silver Cup and £2; Second, £3; Third, £2.

1. C. A. Cain, Esq.
2. Sir James Horlick, Paddockhurst Gardens, Worth (gr. J. Smith).
3. J. Liddell, Esq.

Class 27.—Dessert Pears, 12 dishes distinct.

First Prize, Fruiterers' Company Silver Medal and £2; Second, £1 10*s*.; Third, £1.

1. Lord Somers.
2. Major Powell-Cotton.
3. Capt. M. Abrahams, Oakleigh, East Grinstead (gr. H. Booker).

Class 28.—Dessert Pears, 9 dishes distinct.

First Prize, £1 10*s*.; Second, £1.

1. Earl of Lytton.
2. Lord Hillingdon.

Class 29.—Dessert Pears, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. C. A. Cain, Esq.
2. G. Miller, Esq.

Class 30.—Stewing Pears, 3 dishes distinct.

First Prize, 15*s*.; Second, 10*s*.

1. Dr. Jackson.
2. Sir H. Leon, Bletchley Park, Bucks (gr. G. Cooper).

Class 31.—Plums, 3 dishes distinct.

First Prize, £1; Second, 10*s*.

1. C. H. Berners, Esq., Woolverstone Park, Ipswich (gr. W. Messenger).
2. C. H. Combe, Esq., Cobham Park, Surrey (gr. A. Tidy).

Class 32.—Damsons, or Bullaces, 3 dishes distinct.

First Prize, 10*s*.; Second, 7*s*. 6*d*.

1. F. G. Gerrish, Esq., Pendley Manor Gardens, Tring.
2. Lord Somers.

Class 33a.—Morello Cherries, 50 fruits.

First Prize, 7*s.*; Second, 5*s.*

1. F. G. Gerrish, Esq.
2. Lord Somers.

Class 33b.—Autumn Raspberries, 1 dish of 50 fruits.

First Prize, 7*s.*; Second, 5*s.*

1. J. Liddell, Esq.

No second.

Class 33c.—Alpine Strawberries, 1 dish of 1 lb., with stalks attached.

First Prize, 7*s.*; Second, 5*s.*

No entries.

DIVISION V.

Special District County Prizes.

OPEN TO GARDENERS AND AMATEURS ONLY.

(In this Division all fruit must have been grown entirely in the open.)

N.B.—Exhibitors in Division V. must not compete in Divisions II. or III. or in Classes 1, 2, 3, 4, 13, 21, 22, 23, 24, 26, 27, 28.

Class AA.—Apples, 6 dishes distinct, 4 cooking, 2 dessert.

First Prize, £1 and 3rd class single fare from Exhibitor's nearest railway station to London.

Second Prize, 15*s.*, and railway fare as above.

Class BB.—Dessert Pears, 6 dishes distinct.

First Prize, £1 10*s.* and railway fare as above.

Second Prize, £1 and railway fare as above.

The two above Classes Nos. AA and BB are repeated eleven times as follows, and Exhibitors must enter for them thus :—" Class AA 36 " or " BB 37," and so on, to make it quite clear whether they mean Apples or Pears.

Class 34.—Open only to Kent growers.

AA.

1. Rev. H. A. Bull, Wellington House, Westgate-on-Sea (gr. F. King).

BB.

1. Rev. H. A. Bull.

Class 35.—Open only to growers in Surrey, Sussex, Hants.

AA.

1. Sir James Horlick.
2. C. H. Combe, Esq.

BB.

1. Rev. M. McMurdie, Woburn Park, Weybridge (gr. A. Basile).
2. Sir James Horlick.

Class 36.—Open only to growers in Wilts, Dorset, Somerset, Devon, and Cornwall.

AA.

1. F. J. B. Wingfield-Digby, Esq., Sherborne Castle, Dorset (gr. T. Turton).

2. Lady Mary Morrison, Fonthill House, Tisbury, Wilts (gr. H. H. Mills).

BB.

1. F. J. B. Wingfield-Digby, Esq.

2. Lady Mary Morrison.

Class 37.—Open only to growers in Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

AA.

1. E. E. Pearson, Esq., Brickendonbury, Hertford (gr. W. Stephenson).

2. J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. C. Page).

BB.

1. J. B. Fortescue, Esq.

2. Marquis of Salisbury.

Class 38.—Open only to growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

AA.

1. Rt. Hon. J. W. Lowther, Campsea Ash, Suffolk (gr. A. Andrews).

2. Sir Montagu Turner.

BB.

1. C. H. Berners, Esq.

2. Rt. Hon. J. W. Lowther.

Class 39.—Open only to growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

AA.

1. W. Taylor, Esq., Grinshill, Shrewsbury.

No second.

BB.

1. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).

2. W. Taylor, Esq.

Class 40.—Open only to growers in Worcester, Hereford, Monmouth, and Wales.

AA.

1. C. Crooks, Esq., Impney, Droitwich.

No second.

BB.

1. C. Crooks, Esq.

2. S. Tarling, Esq., Wilton, Droitwich.

Class 41.—Open only to growers in the six Northern Counties of England, and in the Isle of Man.

No entries.

Class 42.—Open only to growers in Scotland.

AA.

1. Capt. Gordon, Threave House, Castle Douglas (gr. J. Duff).

BB.

No entries.

Class 43.—Open only to growers in Ireland.

AA.

1. Earl of Bessborough, Piltown, Co. Kilkenny (gr. A. Tomalin).
2. C. B. Broad, Esq., Aghern, Conna, Co. Cork.

BB.

1. Earl of Bessborough.

No second.

Class 44.—Open only to growers in the Channel Islands.

No entries.

DIVISION VI.

SINGLE DISHES OF FRUIT GROWN ENTIRELY IN THE OPEN AIR.

Six Fruits to a Dish.

OPEN TO GARDENERS AND AMATEURS ONLY.

Nurserymen and Market Growers excluded.

Prizes in each Class, except 75, 76, 111, 147, and 148, as follows:—

First Prize, 7*s.*; Second Prize, 5*s.*; but when the entries exceed six in any Class the Judges may at their discretion recommend a Third Prize of 4*s.*

Choice Dessert Apples.

N.B.—The Judges are instructed to prefer quality, colour, and finish to mere size.

[An Exhibitor may only show one dish in each Class.]

Class 45.—Adams' Pearmain.

1. F. J. B. Wingfield-Digby, Esq.
2. Major St. Maur.

Class 46.—Allington Pippin.

1. Major St. Maur.
2. E. E. Pearson, Esq.

Class 47.—American Mother.

1. F. J. B. Wingfield-Digby, Esq.
2. J. B. Fortescue, Esq.

Class 48.—Barnack Beauty.
1. Earl of Bessborough.
2. F. J. B. Wingfield-Digby, Esq.

Class 49.—Belle de Boskoop.
1. J. A. Stidston, Esq., Bishopsteignton, Teignmouth.
2. Major St. Maur.

Class 50.—Ben's Red.
1. C. B. Broad, Esq.
2. C. H. Berners, Esq.

Class 51.—Blenheim Orange. Small fruits.
1. Mr. T. Smith, Coombe Court Gardens, Kingston-on-Thames.
2. Sir James Horlick.

Class 52.—Charles Ross.
1. Sir James Horlick.
2. J. A. Stidston, Esq.

Class 53.—Christmas Pearmain.
1. I. Lewis, Esq., Bedgebury Park, Goudhurst (gr. J. R. Smith).
2. C. H. Combe, Esq.

Class 54.—Claygate Pearmain.
1. J. F. B. Wingfield-Digby, Esq.
2. E. E. Pearson, Esq.

Class 55.—Cockle's Pippin.
1. C. H. Combe, Esq.
2. R. Staward, Esq., Panshanger, Hertford.

Class 56.—Coronation.
1. Sir James Horlick.
2. J. A. Stidston, Esq.

Class 57.—Cox's Orange Pippin.
1. J. A. Stidston, Esq.
2. Major St. Maur.
3. E. E. Pearson, Esq.

Class 58.—Duke of Devonshire.
1. W. Voss, Esq., Rayleigh, Essex.
2. Sir Montagu Turner.

Class 59.—Egremont Russet.
1. T. O'Donnell, Esq., Tinakelly, Piltown, Co. Kilkenny.
2. F. J. B. Wingfield-Digby, Esq.

Class 60.—Ellison's Orange.
1. Viscountess Enfield.
No second.

Class 61.—Houblon.
1. E. E. Pearson, Esq.
2. F. Bibby, Esq.

Class 62.—James Grieve.
1. Rt. Hon. J. W. Lowther.
2. Lady Mary Morrison.
3. J. B. Fortescue, Esq.

Class 63.—King of Tomkins County (small fruits).
1. Earl of Bessborough.
2 C. Crooks, Esq.

Class 64.—Lord Hindlip.
1. Earl of Bessborough.
2. Major St. Maur.

Class 65.—Mannington's Pearmain.
1. I. Lewis, Esq.
2. B. E. Richardson, Esq.

Class 66.—Margil.
1. R. Staward, Esq.
2. J. B. Fortescue, Esq.

Class 67.—Reinette du Canada.
1. Major St. Maur.
2. Mr. T. Smith, Coombe Court Gardens, Kingston Hill.

Class 68.—Ribston Pippin.
1. Duke of Newcastle.
2. Major St. Maur.
3. Sir Walpole Greenwell.

Class 69.—Rival.
1. E. E. Pearson, Esq.
2. C. Crooks, Esq.

Class 70.—Scarlet Nonpareil.
1. Mr. A. Smith, Convent Gardens, Roehampton
2. Rt. Hon. J. W. Lowther.

Class 71.—St. Edmund's Pippin.
1. J. B. Fortescue, Esq.
2. Sir James Horlick.

Class 72.—St. Everard.
1. J. B. Fortescue, Esq.
No second.

Class 73.—Wealthy.
1. Earl of Bessborough.
2. J. A. Stidston, Esq.

Class 74.—William Crump.

1. Earl Beauchamp, Madresfield Court, Malvern (gr. W. Crump).
2. Sir James Horlick.

Class 75.—Eight fruits of any early variety, not named above fit for use.

Four Prizes, 7s., 6s., 5s., 4s.

1. F. J. B. Wingfield-Digby, Esq.
2. Col. R. Knox, Holt Hatch, Alton (gr. W. West).
3. Sir Montagu Turner.
4. Lady Mary Morrison.

Class 75a.—Eight fruits of any late variety, not named above.

Four Prizes, 7s., 6s., 5s., 4s.

An Exhibitor may only enter one variety in Classes 75 and 75a, in which Classes eight fruits to a dish must be shown for the Judges to be able to taste two of them ; the name of the variety must be given on the Entry Form.

1. B. E. Richardson, Esq.
2. W. Voss, Esq.
3. Mr. A. Smith.
4. Viscountess Enfield.

Choice Cooking Apples.

N.B.—That many Cooking Apples, if kept long enough, make very fair Dessert fruits, as for example Blenheim, Gascoyne's Scarlet, &c. ; and also, *vice versa*, many Dessert Apples make, early in the season, very fair cookers, Charles Ross for example.

First Prize, 7s. ; Second, 5s. ; but when the entries exceed six in any Class the Judges may, at their discretion, recommend a Third Prize of 4s.

N.B.—The Judges are instructed to prefer quality and size to mere colour.

Class 76.—Alfriston.

1. Mr. A. Smith.

No second.

Class 77.—Annie Elizabeth.

1. F. J. B. Wingfield-Digby, Esq.
2. J. B. Fortescue, Esq.

Class 78.—Beauty of Kent.

1. F. W. Platt, Esq., Ken View, Highgate (gr. C. Turner).

No second.

Class 79.—Bismarck.

1. E. E. Pearson, Esq.
2. Rt. Hon. J. W. Lowther.

Class 80.—Blenheim Orange (large fruits).

1. E. G. Mocatta, Esq., Woburn Place, Addlestone (gr. T. Stevenson).
2. C. W. Mann, Esq., Ravenswood, Bexley (gr. J. Simon).

Class 81.—Bramley's Seedling.
1. E. E. Pearson, Esq.
2. H. Whitely, Esq., Highfield, Lelant, Cornwall.

Class 82.—Crimson Bramley.
1. J. A. Stidston, Esq.
No second.

Class 83.—Dumelow's Seedling, *syns.* Wellington and Normanton Wonder.
1. Major St. Maur.
2. Sir Montagu Turner.

Class 84.—Ecklinville.
1. E. G. Mocatta, Esq.
2. Lady Mary Morrison.

Class 85.—Edward VII.
1. Major St. Maur.
2. F. J. B. Wingfield-Digby, Esq.

Class 86.—Emneth Early, *syn.* Early Victoria.
No first.
2. I. Lewis, Esq.

Class 87.—Emperor Alexander.
1. Major St. Maur.
2. E. E. Pearson, Esq.

Class 88.—Encore.
1. C. Crooks, Esq.
No second.

Class 89.—Gascoyne's Scarlet (large fruits).
1. Rt. Hon. J. W. Lowther.
2. J. A. Stidston, Esq.

Class 90.—Golden Noble.
1. E. E. Pearson, Esq.
2. F. J. B. Wingfield-Digby, Esq.

Class 91.—Grenadier.
1. J. B. Fortescue, Esq.
2. Earl of Bessborough.

Class 92.—Hambling's Seedling.
1. Major St. Maur.
2. Earl of Bessborough.

Class 93.—Hector Macdonald.
1. T. Smith, Esq.
No second.

Class 94.—Hormead Pearmain.
1. F. J. B. Wingfield-Digby, Esq.
2. J. B. Fortescue, Esq.

Class 95.—King of Tomkins County (large fruits).
1. J. B. Fortescue, Esq.
2. Major St. Maur.

Class 96.—Lane's Prince Albert.
1. T. O'Donnell, Esq.
2. F. J. B. Wingfield-Digby, Esq.

Class 97.—Lord Derby.
1. Sir Montagu Turner.
2. Rt. Hon. J. W. Lowther.

Class 98.—Mère de Ménage.
1. E. E. Pearson, Esq.
No second.

Class 99.—Newton Wonder.
1. E. G. Mocatta, Esq.
2. F. J. B. Wingfield-Digby, Esq.

Class 100.—Norfolk Beauty.
1. Rt. Hon. J. W. Lowther.
2. J. B. Fortescue, Esq.

Class 101.—Peasgood's Nonesuch.
1. Rt. Hon. J. W. Lowther.
2. Lady Mary Morrison.
3. Major St. Maur.

Class 102.—Potts' Seedling.
1. Rt. Hon. J. W. Lowther.
2. F. J. B. Wingfield-Digby, Esq.

Class 103.—Rev. W. Wilks.
1. F. L. Pike, Esq., Serge Hill, King's Langley.
2. Lady Mary Morrison.

Class 104.—Roundway Magnum Bonum.
No entries.

Class 105.—Royal Jubilee.
1. J. B. Fortescue, Esq.
2. Rt. Hon. J. W. Lowther.

Class 106.—Scarlet Victoria.
No entries.

Class 107.—Stirling Castle.
1. Mr. T. Smith.
No second.

Class 108.—The Queen.

1. Rt. Hon. J. W. Lowther.
2. Mr. T. Smith.
3. Lady Mary Morrison.

Class 109.—Tower of Glamis.

1. J. B. Fortescue, Esq.

No second.

Class 110.—Warner's King.

1. I. Lewis, Esq.
2. Rev. H. A. Bull.
3. Rt. Hon. J. W. Lowther.

Class 111.—Eight fruits of any variety not named above.

Four Prizes, *7s.*, *6s.*, *5s.*, *4s.*

An Exhibitor may only enter one variety in Class 111, in which Class eight fruits to a dish must be shown for the Judges to be able to taste two of them; the name of the variety must be given on the Entry Form.

1. Mr. A. Smith.
2. S. G. Skelton, Esq.
3. G. F. Marsh, Morningside, Wallington.
4. E. E. Pearson, Esq.

Choice Dessert Pears.

First Prize, *7s.*; Second, *5s.*; but when the entries exceed six in any Class, the Judges may, at their discretion, recommend a Third Prize of *4s.*

Class 112.—Beurré Alexander Lucas.

1. Rev. M. McMurdie.
2. F. J. B. Wingfield-Digby, Esq.

Class 113.—Beurré d'Amanlis.

1. C. H. Berners, Esq.
2. Rev. M. McMurdie.

Class 114.—Beurré d'Anjou.

1. I. Lewis, Esq.
2. F. J. B. Wingfield-Digby, Esq.

Class 115.—Beurré d'Avalon, *syns.* Porch's Beurré and Glastonbury.

No entries.

Class 116.—Beurré Bosc.

1. Rt. Hon. J. W. Lowther.
2. Rev. M. McMurdie.
3. F. J. B. Wingfield-Digby, Esq.

Class 117.—Beurré Dumont.

1. Rev. M. McMurdie.
2. F. J. B. Wingfield-Digby, Esq.

Class 118.—Beurré Hardy.
1. C. H. Berners, Esq.
2. F. J. B. Wingfield-Digby, Esq.
3. Rev. M. McMurdie.

Class 119.—Beurré Superfin.
1. C. H. Berners, Esq.
2. E. G. Mocatta, Esq.

Class 120.—Blickling.
1. F. J. B. Wingfield-Digby, Esq.
No second.

Class 121.—Charles Ernest.
1. Rev. M. McMurdie.
2. C. H. Berners, Esq.

Class 122.—Comte de Lamy.
1. C. H. Combe, Esq.
2. J. B. Fortescue, Esq.

Class 123.—Conference.
1. C. H. Berners, Esq.
2. C. H. Combe, Esq.
3. Rt. Hon. J. W. Lowther.

Class 124.—Directeur Hardy.
1. F. J. B. Wingfield-Digby, Esq
2. C. H. Berners, Esq.

Class 125.—Doyenné du Comice
1. T. Smith, Esq.
2. I. Lewis, Esq.
3. F. J. B. Wingfield-Digby, Esq.

Class 126.—Durondeau.
1. Rev. M. McMurdie.
2. A. Smith, Esq.

Class 127.—Easter Beurré.
1. Rev. M. McMurdie.
2. C. H. Berners, Esq.

Class 128.—Émile d'Heyst.
1. F. J. B. Wingfield-Digby, Esq.
2. Sir Montagu Turner.

Class 129.—Fondante d'Automne.
1. Rev. M. McMurdie.
2 C. H. Combe, Esq.

Class 130.—Fondante de Thirriot.

1. Rev. M. McMurdie.
2. Sir Montagu Turner.

Class 131.—Glou Morceau.

1. Rev. M. McMurdie.
2. F. J. B. Wingfield-Digby, Esq.
3. C. H. Berners, Esq.

Class 132.—Gratioli of Jersey.

No entries.

Class 133.—Joséphine de Malines.

1. F. J. B. Wingfield-Digby, Esq.
2. I. Lewis, Esq.
3. J. B. Fortescue, Esq.

Class 134.—Le Brun.

1. Rev. M. McMurdie.
2. F. J. B. Wingfield-Digby, Esq.

Class 135.—Le Lectier.

1. Lord Foley, Ruxley Lodge, Claygate, Surrey (gr. H. C. Gardner).
2. E. G. Mocatta, Esq.
3. Rev. M. McMurdie.

Class 136.—Louise Bonne of Jersey.

1. C. Crooks, Esq.
2. C. H. Berners, Esq.
3. F. Bibby, Esq.

Class 137.—Marie Benoist.

1. C. Crooks. Esq.
2. C. H. Berners, Esq.
3. Rev. M. McMurdie.

Class 138.—Marie Louise.

1. Rev. M. McMurdie.
2. C. H. Berners, Esq.
3. F. J. B. Wingfield-Digby, Esq.

Class 139.—Nouvelle Fulvie.

1. Mr. A. Smith.
2. F. J. B. Wingfield-Digby, Esq.

Class 140.—Olivier des Serres.

1. F. J. B. Wingfield-Digby, Esq.
2. Mrs. Austin, Ellern Mead, Totteridge (gr. E. G. Longhurst).

Class 141.—Pitmaston Duchess.

1. Rt. Hon. J. W. Lowther.
2. Duke of Newcastle.
3. E. G. Mocatta, Esq.

Class 142.—Santa Claus.

1. Sir Montagu Turner.

No second.

Class 143.—Souvenir du Congrès.

1. Rev. M. McMurdie.
2. Rt. Hon. T. F. Halsey, Gaddesden Place, Hemel Hempstead (gr. J. Avery).

Class 144.—Thompson.

1. Rev. H. A. Bull.
2. Duke of Newcastle.

Class 145.—Triomphe de Vienne.

1. Rev. M. McMurdie.
2. J. B. Fortescue, Esq.
3. C. H. Berners, Esq.

Class 146.—Winter Nèlis.

1. F. J. B. Wingfield-Digby, Esq.
2. J. B. Fortescue, Esq.

Class 147.—Eight fruits of any early variety not named above.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. Rev. M. McMurdie.
2. I. Lewis, Esq.
3. W. A. Voss, Esq.
4. Sir Montagu Turner.

Class 148.—Eight fruits of any late variety not named above.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. Rev. M. McMurdie.
2. F. J. B. Wingfield-Digby, Esq.
3. I. Lewis, Esq.
4. Mr. A. Smith.

An Exhibitor may only enter one variety in Classes 147 and 148, in which Classes eight fruits to a dish must be shown for the Judges to be able to taste two of them ; the name of the variety must be given.

FRUIT COMPETITION FOR AFFILIATED SOCIETIES.

Affiliated Societies Challenge Cup.

Apples and Pears.

Six Dishes, distinct, Cooking apples ; Six Dishes, distinct, Dessert Apples ; Six Dishes, distinct, Dessert Pears, six Fruits to each dish.

It is stipulated that no two Societies may combine, and that each Society competing collects all the specimens shown from amongst their own members only, and not from outside.

First, Challenge Cup to be held for 12 months, and Silver-gilt Knightian Medal; Second, Silver-gilt Banksian Medal.

The Cup may be won only once in three years by any one Society; but the winners may compete for any other prizes offered in this Class.

N.B.—If the same Societies which won the Challenge Cup in the preceding years 1912 and 1913 again exhibit, and either is considered by the Judges to be 1st, thus again establishing the excellence of their Society's exhibit, a smaller Silver Cup will be awarded by the Council instead of the Medal offered as the 2nd Prize.

1. Challenge Cup.—Colchester and District Gardeners' Association.

2. Silver-gilt Banksian Medal.—Ipswich and District Gardeners' Association.

CONFERENCE OF SOCIETIES AFFILIATED WITH THE ROYAL HORTICULTURAL SOCIETY, OCTOBER 6, 1915.

Dr. FREDERICK KEEBLE, F.R.S., in the Chair.

The following Societies were represented, namely :—

Twickenham; Egham; Croydon Mutual Improvement; Lewisham; Burnley; Tooting, Balham, Merton, and Mitcham; Addlestone, Chertsey, and Ottershaw; Colchester; St. Barnabas and Sutton; Walworth; Highgate; Hale End; Hertford; Reading; Eastbourne.

1. The Chairman, in opening the Conference, said that since the last Conference was held the country had been passing through very strenuous times which were affecting, in a greater or lesser degree according to circumstances, almost every interest and occupation which had existed prior to the War. To this Gardening was no exception. Gardeners, one and all, had had heart-searchings as to what their attitude to their work, or hobby, should be in this time of pressure. There was no doubt that it was everyone's duty first to help the country in its hour of need, and then, secondly, to go about his ordinary routine and occupation with self-possession and hopefulness. This, particularly, should be the attitude of amateurs towards their gardeners and gardens.

He then briefly reviewed the work which had been done at Vincent Square during the past twelve months to assist Affiliated Societies in their work, to make it progressive, and to increase the facilities for holding meetings and for circulating gardening information.

The first examinations for the National Diploma in Horticulture had been held, and justified the belief that the Diploma is already recognized as an indication, not of book learning, but of real practical skill. The Diploma has won the support of both young and old gardeners and is bound to be a success; and indications already

show it to be well launched. A Degree in Horticulture is being established by the London University, which will still further raise gardening in the rank of the professions, but on this point something more will be said at next year's Conference. During the past twelve months no fewer than eighteen new lectures had been prepared, with 550 slides to illustrate them, raising the number of circulating lectures to sixty with 1,500 slides. Seven new pamphlets of a simple and practical nature had been printed for issue at the nominal figure of 3*d.* a copy post-free, twenty-five for 5*s.* 6*d.*, fifty for 8*s.* 6*d.*, or 100 for 15*s.* Their subjects are as follows :—

(2) The Training of Fruit Trees.

(3) Vegetables and how to grow them in Small Gardens and Allotments.

(4) Flowers for Small Gardens, Window-boxes, and Wall Decoration.

(5) Hardy and Half-Hardy Annuals in the Open Air.

(6) Bottling Fruits and Vegetables.

(7) Vegetable Cookery.

(8) Salads and Salad Making.

Pamphlet (1) on Fruits for Small Gardens, which, during the last fifteen years, has been so popular, is being expanded and revised, and will be republished in a greatly improved form during the winter.

The Chairman then referred to the R.H.S. Fund for the Restoration of Horticulture in the Countries of our Allies. He spoke of the devastation in Serbia, Belgium, and Northern France, and said that it is impossible to do anything beyond collecting funds until the enemy evacuates the countries concerned, but meanwhile every exertion ought to be made so as to have an ample fund in hand the moment it is wanted. At the end of September the amounts subscribed had reached the curious figure of £5,555 5*s.* 5*d.*, but the Council hope that this will soon be greatly augmented.

The Affiliated Societies' Challenge Cup for Fruit has this year been won by the Colchester Society with an excellent exhibit, the Ipswich Society being awarded the second prize.

2. Suggested Competitions between Affiliated Societies in Potato Cultivation.

Mr. Jay, of the St. Barnabas and Sutton Society, introduced the subject of competition in potato cultivation between Affiliated Societies. As a suggestion to others he outlined what his Society had done in such competitions. In his Society potato cultivation had proved to be of special interest. For eight years in succession they had held competitions. Each competitor had been furnished with the same quantity of "seed," of the same variety. All were planted on the same date, but grown according to each competitor's own individual ideas. On being lifted, notes were kept of the number

of tubers produced, their weight, and so on. This year, each competitor was given one 4 oz. tuber, and was only permitted to cut it into two parts. The highest yield had been 17½ lbs. from the two sets. He suggested that a similar competition should be promoted by the R.H.S. between the various affiliated Societies as tending to a general healthy interest between the various Societies concerned.

Mr. Gregory, speaking on behalf of the Croydon Mutual Improvement Society, urged that quality was no less important than quantity, an aspect of the competition which should not be lost sight of.

N.B.—This matter engaged the careful attention of the Council at its meeting on Tuesday, October 12, but it was considered almost, if not quite, impossible for the R.H.S. to organize such inter-Society competitions. It was suggested that they could be far better arranged by Societies themselves within prescribed and limited districts with convenient access to each other. The Council hope to hear that the competitions have been taken up on these lines as being conducive to a healthy spirit of rivalry and good fellowship between the Societies concerned.

3. *The Organization of Town Gardening.*

Mr. Cyril Harding, of the Heart of Mid-London Society, which, for some years past, has been doing such excellent work in back-garden and window-box gardening in the crowded district of Walworth, spoke as follows on this subject:—

In Walworth, one of the most crowded areas, the "Heart of Mid-London Horticultural Society" is doing good work. A garden competition is held every year, and three flower shows take place annually in the Browning Hall. These shows are—the Bulb Show early in April, the Summer Show in July, and the Dahlia Show in September. About 140 entries are received annually in the garden competition, and the gardens are mainly situated in slum districts. The Gardens Guild is endeavouring to do, throughout the whole London area, what is now being done in Walworth. It is our experience that as a means of moral and physical reform there is nothing that can surpass the cultivation of gardens. One of our chief prize-winners was, a year or two ago, a very strenuous patron of the local public-houses. Now he is seldom if ever seen there, and his wife and children fully appreciate the difference. All that was done was to get the man interested in his garden. The result of our work in Walworth is a distinct improvement in the appearance of the district, and fewer bare front and back gardens. The children are being gradually drawn in by means of competitions for drawings and paintings of flowers.

Throughout London and the larger cities there are numerous societies performing a similar work. But there is as yet nothing of the nature of cohesive effort, and there is much overlapping. Many societies suffer for lack of expert advice. There are numbers of

gardeners and others who would help if they knew where their services could be best utilized.

Is it not possible, with the help of the R.H.S. and its Affiliated Societies, to form an organization so that the work of beautifying our towns, and our townspeople, could receive a great impetus ? We suggest the formation of a small committee to thoroughly consider the question. A start might be made with London, and gradually the enterprise could be extended throughout the length and breadth of the country. In Walworth alone there are still several thousands of forecourts lying uncultivated, and there are many back yards which could be turned into fertile and beautiful spots. Every additional tree and plant grown in our city areas means a corresponding increase of the purity of the air. A big addition to our food supplies could also be obtained. Capital exhibits of vegetables have been staged at our Shows this year.

If the R.H.S. would take up this work it would mean that the trade would benefit, the profession of horticulture would be considerably uplifted, and the benefit to the community cannot be estimated.

The interest on the part of the people is enormous ; they do but await the opportunity and the organization.

The Chairman, replying to Mr. Harding, said that gardening of such a character abroad was much more advanced than it was here in London and in other cities of Great Britain. He promised to introduce the matter to the Council with a view of ascertaining what constructive steps could be taken.

N.B.—This matter was considered by the Council of the R.H.S. at its Meeting on Tuesday, October 12, when a Sub-Committee was appointed to consider and report on the possibilities of organizing Town Gardening.

4. The Chairman then spoke on the economical use of land, especially garden land, and the utilization of all possible vacant plots. He said: I am sorry to have to speak so frequently this afternoon, but a task has been imposed upon me—a very important task it is—of addressing you on a subject which is of great importance, that of Increasing the Food Supply. You will probably have read that the Government has publicly issued an appeal to the farmer to grow more wheat, but the cottager and allotment-holder should also do his or her utmost to increase food production.

The day before war broke out, the Secretary of the R.H.S. and I considered that the war might last a long time, and it was obviously a matter of vast importance to increase immediately the food supply in the country. So we drafted a letter to the press, which was published widely in London and in the Provinces. We followed that up by forming a committee at Vincent Square to deal with correspondence and matters arising out of this letter, and we issued many thousands of pamphlets on the subject. We

also acted as a sort of clearing-house for the supply of cabbage and such like plants. Thus we caused more ground to be cultivated, and we aroused a very great interest among people who had hitherto little interest in their gardens. However, I appeal to you to endeavour through the medium of your societies to see to it that every possible piece of vacant ground that can be secured is put under cultivation, and in cases of difficulty in securing land appeal should be made to your local Council or to some local gentleman of influence. I would appeal to you to do that throughout the coming year. There is no evidence that we shall be freed from the nightmare of this war just yet. I would particularly point out to you, first, the advantages of growing potatos on poor land with the aid of a little artificial manure; and second, that a very large number of people do not arrange their gardens on the most remunerative plan. I was astonished to notice last winter how much ground remained vacant. Far more might be done by clearing the ground from the early crops and cultivating onions, turnip, beet, cabbages, carrots, &c. What is essentially wanted is local initiative and effort. The R.H.S. has done much and is willing to do more, if it can be done, to benefit the country at large, but without local organization its powers are limited. It is a great mistake to leave it to the enthusiastic amateur who knows nothing of gardening. It is not that sort of man whom we want to take the lead in this local initiative. Yours, gentlemen, is the duty of forming local plans for the increase of ground under small cultivation. I would point out to you that it is all very well to leave the responsibility with the farmer; he at best gets crops from his land which compare but modestly with those of the garden in productiveness.

A delegate of the Croydon Society explained how this subject had been taken in hand in his neighbourhood by the Croydon Guild of Help, with which the members of his society had co-operated. With the assistance of the Corporation and local gentlemen, over 100 plots of land were now under cultivation. There was great local interest in the subject.

The Secretary of the R.H. Society, in referring to this same movement, said that whilst we are thus busily engaged in promoting the production of food supplies do not let us quite forget the flowers. They, too, have their place in the mental economy and the healthy spirit of the country. He himself was growing twice the quantity of vegetables he had done formerly. Cabbages were planted in the rose beds, but not to the exclusion of the roses, which had given to him and to many others their usual measure of pleasure and happiness this year.

The Secretary of the Hale End Society read a paper from which the following are extracts :—

"We invited those who desired to take up additional land for the purpose of vegetable-growing to forward their names to the society. One thousand circulars were distributed; the immediate response

was four favourable replies only. On the basis of this small beginning application was made to a local landowner who had vacant building plots. We won his sympathy and his willingness to help us as far as he could, with the result that sufficient ground was provided for six plots of 7½ rods each at a rent of 5*s.* a plot yearly. He could not, however, promise its use for a longer period than twelve months. The four applicants forthwith received their allotments. On the same day, before nightfall, the other two plots had been applied for and allotted. The curiosity of passers-by was aroused during the next few days, with resulting applications for similar accommodation. The same owner again generously responded to the demand, and so the work gradually grew until by the end of April no fewer than fifty men had been accommodated with plots of ground. There was a difficulty in providing the necessary fencing. A meeting of the tenants was held, and it was decided that each should deposit the sum of 12*s.* 6*d.* with the Treasurer to meet the cost, and that they should erect it themselves. This so far reduced the expense as to bring about a return of 2*s.* 9*d.* to each plot-holder, the owner of the land at the same time undertaking that he would refund the cost of the fencing should the land be required before the end of September 1916.

"Many of the tenants had never grown vegetables before, but with help, information, and guidance received from their neighbours, progress was made and the crops had been splendid. As proof of the success of the undertaking, permission was given at the beginning of this month (October) for the remaining portion of the field to be adopted for this purpose."

The Conference closed by an exhibition of lantern slides illustrating informal and natural gardening.

GENERAL MEETING.

October 12, 1915.

Dr. F. Keeble, F.R.S., in the Chair.

Fellows elected (19).—Mrs. C. B. Alexander, Rev. J. W. R. Brocklebank, Mrs. A. Dashwood, Mrs. J. Duff-Coghlan, Mrs. Wilford Fox, Mrs. J. M. Hall, Capt. E. C. Hardy, R.N., Miss A. J. Hawkins, P. Holt, P. Honri, Mrs. R. Le Doux, Lady Lever, G. Lucciarini, Mrs. H. E. Marshall, J. C. Meikle, B. Spires, Mrs. F. C. Stokes, Mrs. Swinfen-Broun, Mrs. Woodd.

Fellows resident abroad (3).—O. Bartels (Queensland), James Forbes (Ontario), E. Smith (Manitoba).

Associates (4).—Miss G. Cliffe, J. W. Collis, Miss G. Hiley, Miss F. M. Sharpe.

A lecture on "The History of the Classification of the Apple" was given by Mr. E. A. Bunyard, F.L.S. (see p. 445).

GENERAL MEETING.

October 26, 1915.

Mr. W. A. Bilney, J.P., in the Chair.

Fellows elected (9).—J. H. Birch, H. A. Churchill, Miss E. M. Cleghorn, A. Pallis, R. C. H. Phelips, H. O. Serpell, Mrs. E. Streather, W. B. Taylor, F. T. Woodfield.

Fellow resident abroad (1).—T. C. Holmes (California).

Associate (1).—Miss J. M. Otton.

A lecture on "The Wisley Garden" was given by Mr. S. T. Wright.

GENERAL MEETING.

November 9, 1915.

Dr. F. Keeble, F.R.S., in the Chair.

Fellows elected (10).—Mrs. B. O. Dickinson, C. Downs-Butcher, Sir William Duke, K.C.I.E., F. S. Glass, L. A. Huth, H. Kaye, B. H. Oliver, Rev. W. H. Partridge, Hon. Mrs. T. Sopwith, G. W. Wilton.

Associate (1).—Mrs. B. Betbeder.

A lecture on "Some Books on Rock-gardening and Alpine Plants" was given by Mr. E. A. Bowles, M.A. (see p. 393).

GENERAL MEETING.

November 23, 1915.

Mr. Joseph Cheal, V.M.H., in the Chair.

Fellows elected (5).—Mrs. James Hamilton, Dr. J. B. Hurry, Roy Pinsent, Mrs. F. E. Powell, John Ward.

Fellows resident abroad (3).—A. S. K. Iyengar (Bombay), Mrs. Wheeler H. Peckham (New York), Vivian A. Renwick (Kaduna, Nigeria).

Associates (6).—C. H. Anderson, G. N. Brandt, J. Ferguson, Thomas Oliver, William E. Petley, E. Tack.

A lecture on "Leaf Vegetables and how to Cook Them" was given by Mr. C. Herman Senn (see p. 436).

GENERAL MEETING.

December 7, 1915.

The Rev. W. Wilks, M.A., V.M.H., in the Chair.

A lecture on "The Wisley Rock Garden" was given by Mr. D. Sarsons (see p. 415).

SCIENTIFIC COMMITTEE.

SEPTEMBER 14, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Erica vagans deformed.—Mr. P. D. Williams sent specimens of *Erica vagans* in which the flowers were replaced by multiple bracts.

Pear-like Apple.—Mr. E. A. Bunyard, F.L.S., sent an apple with a curious pear-like form, very similar to one described by Parkinson, and possibly identical with his.

Begonia leaf-mite.—Mr. Lydiatt, of Barnwell Castle Gardens, Oundle, sent foliage of Begonias attacked by the Begonia leaf-mite, which had been fumigated without avail. Dipping affected foliage in a wash made by kneading flowers of sulphur into a handful of soft soap, and subsequently dissolving the mixture in 1½ gallon of water, appears to be the safest and most effective means of checking this pest.

Glassiness in Apple.—Mr. Smith, of Lewisham, sent a fruit of 'Lord Derby' grown at Forest Gate showing the glassiness which is common in many varieties of apples in certain seasons, and is apparently due to some physiological cause.

Galls on Sainfoin.—Mr. J. W. Odell showed specimens of the Giant Sainfoin with galled flowers in which the ovaries had not developed. The insect causing this condition has been identified provisionally by Prof. F. V. Theobald as *Contarinia onobrychidis* Kieffer, one of the Cecidomyidae. The attack seems to be general in Cambridgeshire and will cause serious loss in seed. Feeding off with sheep, deep cultivation, and a re-arrangement of the rotation so as to separate leguminous crops appear to be necessary to lessen the attack.

Virescent Honeysuckle.—Mrs. Dowding, of Wimbledon, and Mr. Odell both showed virescent, regular flowers of the common Honeysuckle, similar to those described in Masters' 'Teratology.' It was not stated whether the plants were attacked by aphides, as is so frequently the case when the flowers are found in this condition.

Gladioli and Montbretias.—Corms of Gladioli and Montbretias were sent from various sources with the complaint that they had failed to flower properly and that the foliage had become brown prematurely. The Committee considered the trouble to be due to alternate periods of drought and moisture. No fungus was present on the corms, and the fungus spots upon the leaves were evidently saprophytic.

Pear attacked by Mites.—Mr. J. Ramsbottom, M.A., reported that the pear leaves submitted to him had been damaged by one of the spinning mites, *Tetranychus bimaculatus.*

Scientific Committee, September 28, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with seven members present, and Mrs. Lloyd Edwards, visitor.

Saxifraga × *Hausmannii* var. 'Trevor.'—Mrs. Lloyd Edwards exhibited a specimen of this hybrid Saxifrage which she had raised by crossing *S. mutata* ♀ with *S. Aizoides atrorubens*. It has an erect raceme of flowers about 9 inches high, each flower being about half an inch in diameter, with narrow orange-coloured petals. The leaves form distinct rosettes. A Botanical Certificate was unanimously recommended for this plant.

Polygonum dumetorum.—Mr. J. Fraser showed specimens of *P. dumetorum* which he had collected at Woodham, Surrey, remarking that it occurred in hedgerows as a rule, and soon disappeared, as it germinated only where bare patches occurred.

Salsola Tragus.—Dr. J. A. Voelcker showed this weed, which had appeared in some fields of lucerne grown from American seed. It is a native of Europe, and fairly widely distributed with cultivated plants.

Davidia involucrata.—Mr. E. A. Bowles showed fruit of *Davidia involucrata* from a tree in Mr. Christie's garden at Framlingham Pigot, Norfolk, in the open. It is not certain that the seeds were properly formed.

Potatos "blind."—Dr. A. S. Horne reported that he had examined the potatos from Mr. Cuthbertson and considered that the failure to produce sprouts might be due to several causes :—

(1) Some fungus operating in the field. *Phytophthora infestans* itself may cause "blindness" through invasion and ultimate destruction of tissue at the eyes. Such tubers frequently escape attention in sorting, and if stored, which very frequently happens, not only carry over the fungus, but fail to germinate or produce weakly plants.

(2) Cultural conditions. Improper conditions in the store, causing deterioration of the tubers and rendering the eyes useless. This would include overheating in pits after being lifted, the overheating killing most of the eyes.

(3) Attacks of fungi and bacteria owing to conditions of storage unfavourable to the tuber.

(4) Attacks of aphides. The eyes may be injured or destroyed, or subsequently destroyed by fungi and bacteria in store.

(5) Varietal causes—the so-called "won't grow" disease—*e.g.* in the variety 'President.' When grown at Wisley, many tubers, although possessing apparently healthy eyes, failed to germinate, or germination was greatly retarded in them (see R.H.S. Journal, vol. xxxix. p. 595).

Judging by the condition of the specimens sent, the trouble in this case was probably due to either the second or third suggested cause.

Potato Disease.—Dr. Horne also drew attention to the erroneous belief which is somewhat prevalent that the fungus *Phytophthora infestans* travels down infected stems to the tubers below, whereas the usual sources of infection of tubers are the spores produced on the leaves.

Curious Result of Inarching.—Mr. Thos. Sharp, of Westbury, sent a photograph and specimens of Grapes from a scion of 'Muscat of Alexandria' inarched upon a 'Black Hamburgh' vine. The larger bunch sent was from a lateral arising at the point of inarching, the smaller from much higher up the scion. The bunch from the point of inarching gave a better "set" than the other bunch; many of the berries departed from the shape of the Muscat, and they were nearer ripening than those of the smaller bunch, although subjected to the same treatment. The inarching was effected some years ago, and the same result has been seen in former years.

Euonymus japonica with Roots on Stem.—Colonel Sandeman sent a shoot of *Euonymus japonicus* with a dorsiventral appearance, many roots growing from the side of the stem away from the light, similar to those produced by Ivy.

Fremontia californica fruiting.—Mr. C. D. Langworthy, of Claygate, sent fruits of *Fremontia californica* from his Claygate garden, where it is growing on a clay soil.

Lotus Tetragonolobus.—Lady Lawrence sent plants and green fruits of this old garden plant under the name of 'Asparagus Peas.' It is figured in the *Botanical Magazine*, t. 151, and its curious four-winged fruits and deep red flowers secured it a position in gardens even before Parkinson's time. It has been used as a vegetable for many years in different parts of the country (especially, Miller informs us, in the north), and Lady Lawrence sends the following recipe for its cooking, the pods being cooked whole:—"Boil twenty minutes in salt and water, with a pinch of soda; strain off and put into a saucepan, with the following sauce: one tablespoonful of cream, a pinch of salt and pepper, and a small piece of butter. Cook for ten minutes."

Clerodendron ugandense.—Lady Lawrence also sent this fine bluish-flowered shrub, which had been planted out in her garden at Burford in May last, and was now flowering profusely.

Pitcairnia albucaefolia.—An uncommon plant was sent in flower by Lady Ilchester from Holland Park, Kensington, under this name.

Scientific Committee, October 12, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Astelia Banksii.—Mr. Fraser drew attention to the plant from Holland House, Kensington, shown at the last meeting under the name of *Pitcairnia albucaefolia.* It had been so named from its

foliage, but now it had flowered it proved to be *Astelia Banksii*, a native of North Island, New Zealand. Dr. Rendle confirmed Mr. Fraser's identification of the plant and said that it formed a curious feature of the vegetation of New Zealand, often growing as an epiphyte as well as in the soil.

Antirrhinum eaten by animals.—Mr. Cuthbertson called attention to the damage done by some gnawing animal (possibly the short-tailed field mouse) to the developing fruits of Antirrhinums at Mark's Tey, Essex. The half-ripe fruits were bitten through and either partly or wholly devoured. The only variety attacked out of a great number was 'Yellow King.'

Curious Hazel.—Dr. Rendle showed a curious Hazel having the edges of the cup (which was of the *Avellana* type) very deeply divided into long, finger-like processes.

Pinus with juvenile and mature foliage.—Messrs. Cheal exhibited a plant of *Pinus Pinea* about 3 feet in height bearing both juvenile and mature foliage, the juvenile form being present on shoots both at the base and near the top of the tree. Sir D. Morris had recently noticed a similar thing on large trees of this species near Bournemouth, and the tree not uncommonly produces them when cut back.

Rose attacked by Botrytis.—Mr. J. H. Gould sent shoots of Roses attacked by the fungus Botrytis. The course of the disease was said to be as follows:—" First a shoot shows the disease; this may be either in the middle or towards the top of the shoot—never at the base. The attack commences at one side. When it has worked completely round the shoot it progresses both upwards and downwards until it has destroyed the whole shoot. The plants are not dying from the base; on the contrary, the base is the last part of the plant to show sign of disease." The fungus probably attacks shoots damaged or weakened by some cause, the result being similar to that seen in the attack of the same fungus on Gooseberries.

Gall on root of Cupressus.—Mr. Finlay Sanderson, of Chislehurst, sent a large gall (larger than a cricket ball) from the root of a tree of *Cupressus Lawsoniana.* Similar galls on the roots of Cupressus and other plants have frequently been shown before the Committee, and are probably due to the attack upon the plant of *Bacillus tumefaciens.*

Scientific Committee, October 26, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Astelia Banksii.—A Botanical Certificate was unanimously recommended for this plant, shown by Lady Ilchester under the name *Pitcairnia albucaefolia,* and grown in a cold house at Holland House for some years until it flowered.

Lamium amplexicaule.—Mr. J. Fraser showed specimens of this common weed, which, he said, usually produced cleistogamous flowers, but of which he had found specimens bearing well-developed open flowers in different localities in the north and midlands.

Potato tumour.—Mr. W. Cuthbertson sent a specimen of Potato in which the leaf was attacked by the organism of Potato tumour, *Synchytrium endobioticum.* The disease rarely occurs upon the aerial portions of the plant.

Magnesium and Lime.—Dr. J. A. Voelcker drew attention to two cases of infertility in what was apparently good soil, to which his attention had been drawn recently. In both he had found abundance of the necessary elements of nutrition, but in each the percentage of magnesia was greater than that of lime. He has frequently drawn attention to the result of this excess of magnesia in producing infertility, and to the cure, which is application of a further dressing of lime.

Nerines, Time of Flowering.—Mr. J. T. Bennett-Poë, V.M.H., drew attention to the time of flowering of a beautiful *Nerine* which he exhibited, named 'Rotherside,' which had been raised from seed of *Fothergillii major,* which flowers at the end of August, the pollen parent being unknown. The flowering time of the seedling was at the middle and end of October, owing probably to the influence of the pollen parent.

Malformed Honesty.—A curious fruit of Honesty sent by Mr. J. Staley, of Hayling Island, was exhibited. The dissepiment had two outgrowths from it, so that four wings were produced at right angles to one another. The fruit showed signs outside of the presence of these wings in the formation of four valves.

Sporting in Coprosma.—Lady Lawrence sent shoots of a *Coprosma* for which the name *burfordensis* was proposed, in which the variegation of *C. Baueri variegata,* from which it had sported, was transposed. In the original plant the margin of the leaf was yellow, the centre green ; in the sport the centre was yellow, the margin green.

Supposed sporting in Pear.—Mr. C. H. Hooper sent foliage from a large Black Worcester Pear tree about 80 to 100 years old and about 40 feet in height. It had, he thought, been grafted near the ground line. Eight feet from the ground a clean grown branch exists some seven years old, which has fruited some two or three years. The leaves of this branch are two or three times the size of those of the Black Worcester, and the fruit is golden and ripe at the end of August instead of in late autumn. No budding or grafting has been done during the forty years the owner has known the tree.

It is, of course, difficult to say definitely whether the grafting was done at the bottom of the tree after this lapse of time, and if, as is possible, it was done some distance up, it is probable that the supposed " sport " is really a branch from the stock.

Scientific Committee, November 9, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Fungus on Yew.—Dr. A. S. Horne reported that Mr. Ramsbottom had identified the fungus shown by Mr. Bowles at the previous meeting from a Yew tree trunk at Myddelton House, Waltham Cross, as *Polyporus lacteus.*

Four-carpelled Honesty.—Mr. W. C. Worsdell, F.L.S., said that he had further examined the curious dissepiment of Honesty sent to the last meeting, and had come to the conclusion that the fruit of which it was a part was four-valved. This conclusion was subsequently corroborated by a letter from Mr. Staley, the sender, who said that the fruit had four valves, but some were lost before he could send them. This was the only fruit of the kind on the plant. Four-valved fruits had been described in the case of *Capsella Bursa-pastoris, Cheiranthus, Brassica,* and *Isatis,* and a higher number of valves has sometimes been found; in some cases plants possessing them have been found to breed true to the high number of valves.

Black Spot in Roses.—Dr. Horne drew attention to the origin and spread of an outbreak of black spot in Roses in a garden which he had had under observation. The first Roses were planted in 1911, and included H.P., H.T., and Tea Roses, as well as a few climbers. Additional Roses, including 'Juliet' and several standard Roses, were added in 1912; in 1913 'Noëlla Nabonnand,' 'Madame Léon Pain,' 'Una,' and 'Lyon' were added. No trace of black spot (due to the attack of *Actinonema Rosae*) appeared until 1914, when the two dwarf 'Lyon' Roses were affected, and soon lost all their leaves. Towards the end of the season a few of the lower leaves of 'Noëlla Nabonnand' were also spotted. In 1915 not only was 'Lyon' completely defoliated, but 'Madame Léon Pain,' 'Madame Abel Chatenay,' and 'Una,' in the same row with 'Lyon,' lost nearly all their leaves, and the spot spread to a number of other Roses. The varieties affected (in addition to those already mentioned) were: 'Caroline Testout,' 'Mrs. J. Laing,' 'Frau Karl Druschki,' 'Gruss an Teplitz,' 'Hugh Dickson,' 'Madame Ravary,' 'Carmine Pillar,' 'Laurent Carle,' 'Juliet,' 'Mrs. Sharman Crawford,' 'R. G. Crawford,' and 'Killarney.' It seems evident that the introduction of the black spot was due to the introduction of the 'Lyon' Rose, and that it spread from that to other Roses of various types with ease.

Seedlings of Trees.—Mr. J. Fraser, F.L.S., said he had recently found seedlings of a variety of trees on the Leatherhead Downs, twenty-seven in all, and that in one gravel-pit he had found three species of Lemna (*L. polyrrhiza, L. minor,* and *L. trisulca*), and the rare *Wolffia arrhiza,* the smallest of flowering plants.

Adventitious Bud on Fern.—Mr. H. B. May sent a piece of the Fern *Microlepia platyphylla* with an adventitious bud.

SCIENTIFIC COMMITTEE, NOVEMBER 23, 1915.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and twelve members present.

Bud on Fern petiole.—Mr. W. C. Worsdell, F.L.S., said he had examined the piece of frond of the Fern (*Microlepia*) shown at the last meeting, and found that the bud arose from the upper surface of the stalk, and not, as is more common with buds on Fern fronds, from the lower. The position of an adventitious bud on the upper surface is, however, normal for some species.

Lilium sp. from Hong Kong.—Mr. H. J. Elwes, F.R.S., referred as follows to specimens of a Lily sent from Hong-Kong :—"It seemed to me to be indigenous, and it is included in the local floras as *Lilium Brownii.* Of two specimens which I flowered one was much more like *L. longiflorum* in leaf and in the tubular flower. Mr. Grove thinks, as I do, that the Hong-Kong plant is most like what has been called *Brownii leucanthum* from Central China, but that should have axillary bulbils, and is a very different plant from the cultivated *Brownii*, which, so far as Mr. Groves knows, has not been found in a wild state. Franchet says that the only difference between *longiflorum* and *Brownii* is that one has a glabrous and the other a pilose nectary, but this difference in the flower of *longiflorum* which I send for comparison seems trifling." These specimens were referred to Mr. W. C. Worsdell for further examination (p. cci).

Fruits of Citrus trifoliata.—Several small fruits (containing seeds) of the hardy *Citrus trifoliata* (*Aegle sepiaria*) were sent by Lady Ilchester from Holland House. They had been produced on a tree 9 feet high by 5 feet through, growing there.

Foliose spathe of Cypripedium.—Mr. J. T. Bennett-Poë, V.M.H., showed a flower of *Cypripedium insigne* 'Harefield Hall' subtended by a spathe which had developed into a leaf precisely similar to the ordinary foliage leaves of that plant. The plant had borne a second flower with a similar spathe.

Supposed sporting in Pear.—Miss H. Barr, of Apsley Cottage, East Grinstead, sent a Pear 'Beurré Diel' with the following curious history: "It was originally a Pear tree which bore very small, indifferent summer Pears, and a graft from a good tree, name unknown, was put into it by a friend in this neighbourhood thirty years ago. The graft never gave sign of growth, and the stock, which was cut back when grafted, threw up fresh branches, and bore the same poor fruit as before for twenty-five years. Then a new shoot appeared of quite a different character, which blossomed and bore one very fine Pear. This was only four years ago, and it was 18 inches below the place where the graft was put in. To strengthen that shoot we cut off the branches of the stock once more, after which three more shoots of the same character as the one just mentioned appeared and bore the same kind of fruit. These were still lower down on the parent

stem. We then cut down the trunk of the parent tree to within a short distance of these new shoots, and far below the place where it had been grafted, with the result that these four shoots have strengthened and this year have borne ten fine Pears, similar to the one sent." The Committee thought the probable explanation of the curious history was that the Pear tree had originally been double-grafted, the variety 'Beurré Diel' being used as the intermediate stock, and that dormant buds had suddenly wakened into activity after a rest of at least twenty-five years.

Double Apple.—Mr. T. H. Dipnall sent an Apple which had two cores and appeared from the outside to be two Apples cohering and arising from a single stalk. This kind of double fruit is not very uncommon, and apparently arises from a fasciated flower containing two pistils.

Damage by Hail.—Dr. J. A. Voelcker sent Apples and Pears from a garden in Molesey, of which it is reported that the owner was certain that prior to a hail-storm (which occurred either on July 11 or July 18 of this year) the fruit was unmarked, and that the next morning he saw, on trees exposed to the full storm (hail-stones lay thick upon the ground), the pittings or markings now to be seen upon the fruit. On the Apples the pits were rounded depressions of a different green from the rest of the fruit, and on the Pears they were similar but had also cracked. In some places agglomerations of stone-cells occurred just beneath and attached to the skins, similar to those seen in the disease (which is considered to be of physiological origin) called "lithiasis." Similar growths have also been ascribed to the attacks of mites.

Gall on Willow.—Lady Margaret Bickersteth sent from Cottingham a terminal gall with a rosette of rather broad leaves from a Golden Willow. This gall is the result of the attack of the gall-fly *Cecidomyia rosaria* upon the terminal bud, and is of common occurrence in some species of Willow.

Scientific Committee, December 7, 1915.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair and six members present.

Fruits of Purple Apples.—Mr. J. Fraser, F.L.S., showed fruits of *Pyrus Niedzwetzkyana* and *P. floribunda purpurea* (=*floribunda* × *Niedzwetzkyana*), the latter being much smaller than the former and having some of the characters of *P. baccata*.

Large Ascidium in Savoy.—Mr. G. Wilson, F.L.S., sent an ascidium of large size from the garden of Lady Katherine Somerset, Reigate Priory. This malformation is common in Cabbage foliage, and the funnel-shaped growth appears to be terminal. The funnel in this case measured about 10 inches across at its open end, and as much deep.

Callipsyche aurantiaca.—Mr. J. T. Bennett-Poë, V.M.H., showed an inflorescence of this striking Amaryllid from the Andes of Ecuador, and a further specimen of *Cypripedium insigne* 'Harefield Hall' with a larger foliose spathe than that exhibited at the previous meeting.

Narcissus Fly attacking Hippeastrum Bulb.—Mr. William Gay of Crowhurst Park, Battle, Sussex, sent a bulb of *Hippeastrum* in which the larva of the Narcissus fly, *Merodon equestris*, was feeding. This pest has previously been recorded as attacking *Hippeastrum* as well as other greenhouse bulbs.

Lilium from Hong Kong.—Mr. W. C. Worsdell reported that his examination of the nectary of *Lilium longiflorum* showed it to be very slightly pilose, not glabrous. There is therefore only a difference of degree between the two lilies under discussion as regards this character. (See p. cxcix.)

FRUIT AND VEGETABLE COMMITTEE.

SEPTEMBER 14, 1915.

Mr. JOS. CHEAL in the Chair, and seventeen members present.

Awards Recommended :—

Gold Medal.

To Mr. J. C. Allgrove, Langley, for fruit trees in pots.

Silver-gilt Knightian Medal.

To Rt. Hon. Marquis of Ripon, Coombe Court (gr. Mr. Thos. Smith), for Apples and Pears.

Silver Knightian Medal.

To Messrs. S. Spooner, Hounslow, for Apples and Pears.

Silver Banksian Medal.

To Messrs. Bunyard, Maidstone, for Damsons and nuts.

Award of Merit.

To Strawberry 'St. Fiacre,' from Messrs. Bunyard, Maidstone. An autumn-fruiting variety of large size. Fruit of cockscomb shape, brilliant crimson; seeds large, yellow, and prominent. A most reliable and free cropper.

Other Exhibits.

Rev. A. Carter, Leicester: seedling Apple.
Mr. G. E. Dyke, Milborne Port: Apple 'Crundle.'
Mr. W. Gee, Ventnor: Apple 'Devonshire Queen.'
Mr. Holding, Wymeswold: Peach 'Hall's Favourite.'
Messrs. Laxton, Bedford: seedling Plums and Apples.
Mr. W. Profittlich, Twickenham: Himalayan Blackberry. (**F.C.C.** 1915.)
Rev. H. C. Sculthorpe, Weston-super-Mare: Apple 'Beeley Pippin.'
Mr. W. D. Vizard, Churchdown: Plum 'Monarch' × 'Grand Duke.'
Messrs. Whitelegg & Page, Chislehurst: Damsons.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 28, 1915.

Mr. JOS. CHEAL in the Chair, and fourteen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for vegetables.
To Messrs. Sutton, Reading, for vegetables.

Silver Knightian Medal.

To Mr. J. C. Allgrove, Langley, for a collection of fruit.

To Messrs. Bunyard, Maidstone, for Figs and Grapes.

To Messrs. Dickson & Robinson, Manchester, for Onion 'Premier.'

Silver Banksian Medal.

To The Church Army, Bryanston St., W., for a collection of vegetables.

To the Purfleet Council School, Essex, for fruit.

Award of Merit.

To Apple 'Edwin Beckett' (votes unanimous), from the Hon. Vicary Gibbs, Aldenham (gr. Mr. E. Beckett). Fruit very large, similar in form, colour, and general appearance to 'Peasgood Nonesuch,' but distinct in foliage and growth. Flesh also similar to 'Peasgood Nonesuch,' but quite distinct when cooked. This variety originated amongst seedlings growing in the allotment gardens at Elstree; no attention has been given to the tree since germination, but the Sub-Committee who inspected the tree reported that it wàs a good grower, carrying a heavy crop of large fruits. (Figs. 119, 120.)

Other Exhibits.

J. W. Boyce, Esq., Welney: Apple 'Boyce's Pearmain.'

Messrs. Bunyard, Maidstone: Pear 'Beurré St. Nicholas,' syn. 'Duchesse d'Orléans.'

Messrs. Dickson & Robinson, Manchester: Onion 'Royal Keeper.'

Miss J. Ede, Bexley Heath: Apple 'The Wonder.'

Mr. W. Pope, Newbury: Apple 'Royal Edward.'

Elizabeth, Lady Lawrence, Dorking: Asparagus Peas (*Lotus Tetragonolobus*).

Messrs. Laxton, Bedford: seedling Plums.

Mr. G. W. Miller, Wisbech: Apple 'Clarkson.'

J. Steell, Esq., Stony Stratford: seedling Apples.

Mr. Stevens, Willesden: Pear 'Stevens' Seedling.'

E. Verner, Esq., South Norwood: seedling Peaches.

W. D. Vizard, Esq., Churchdown, Bucks: Plum 'Victor Christian.'

Fruit and Vegetable Committee, September 30, 1915.

Sub-Committee at Wisley.

Mr. Owen Thomas, V.M.H., in the Chair, and two members present.

The following awards were recommended to be approved at the meeting of the full Committee:—

Award of Merit.

Autumn Cabbage.—No. 14, 'Erfurt Early Red.'

Highly Commended.

Autumn Cabbage.—No. 107, 'Dwarf Drumhead'; No. 100, 'Enkhuizen Glory'; No. 3, 'Miniature Red.'

Parsnips.—Nos. 34, 35, 37, 'Intermediate'; No. 3, 'Webb's Student'; No. 32, 'Tender and True.'

Commended.

Autumn Cabbage.—No. 105, Copenhagen Market; No. 8, Red Pickling; No. 2, Sutton's Dwarf Blood Red.

Parsnips.—No. 12, Hollow Crown Improved; No. 27, 'Lisbonnais'; No. 21, 'Model White'; No. 1, 'Student.'

The Committee considered that many of the varieties of Red Autumn Cabbage were not fit for garden use, owing to the large amount of space they occupied and the smallness of their hearts.

For descriptions of above, see Reports, p. 471 and p. 479.

Fruit and Vegetable Committee, October 5, 1915.

Mr. C. G. A. Nix in the Chair, and thirty-one members present.

Cups and Medals were awarded by the Council, after consultation with the judges, see p. clxii.

Other Exhibits.

Messrs. Geo. Cooling, Berks; Apple 'Nash's Seedling.'

Mrs. C. W. Banbury (gr. Mr. A. J. Fuller), Farringdon: Apple 'Cox's Orange Pippin.'

Geo. Lovelock, Esq., Hereford: Apple 'Winter Beauty.'

Fruit and Vegetable Committee, October 12, 1915.

Mr. Jos. Cheal in the Chair, and five members present.

Awards Recommended:—

Silver-Gilt Knightian Medal.

To the Barnham Nurseries, Ltd., Barnham, for fruit.

Bronze Banksian Medal.

To Messrs. F. H. Chapman, Rye, for Capsicums.

The Awards recommended by the Wisley Sub-Committee on September 30 were confirmed.

Other Exhibits.

The Right Hon. Lord Braye (gr. Mr. Beames), Rugby: Apple seedling.

Messrs. Bunyard, Maidstone: collection of nuts.

J. F. Coffin, Esq., Stamford Hill: Apple 'Coffin's Marvel.'

Geo. E. Dyke, Esq., Milborne Port: Apple 'Dorothy' and Apple 'Kingsbury Pippin.'

Chas. C. Paine, Esq., Haverstock Hill; Apples and Pears.

The Rev. Prof. P. Power, Cork: Apple 'Galtee Pippin.'

Fruit and Vegetable Committee, October 26, 1915.

Mr. Jos. Cheal, V.M.H., in the Chair, and fourteen members present.

Awards :—

Silver-gilt Hogg Medal.

To C. A. Cain, Esq., Welwyn (gr. Mr. T. Pateman), for a collection of fruit.

To C. G. A. Nix, Esq., Crawley (gr. Mr. E. Neal), for Apples and Pears.

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for a collection of vegetables.

To W. Tayler, Esq., Hampton, for a collection of fruit.

Other Exhibits.

Wm. Booth, Esq., Lincoln : Pear ' Marie Louise.'

Alfred Edwards, Esq., Fordham : Apple ' Knight's Seedling.'

J. Kendall, Esq., Salisbury : Apple ' Kendall's Foundling.'

J. Kettle, Esq., Wimborne : seedling Raspberry.

G. Tinder, Esq., Fleet : seedling Raspberry.

Mr. J. Williams, Worcester : Apple ' Rimell's Seedling.'

Fruit and Vegetable Committee, November 9, 1915.

Mr. Jos. Cheal in the Chair, and nine members present.

Awards Recommended :—

Gold Medal.

To Mr. Alfred Dawkins, Chelsea, for a collection of vegetables.

Silver-gilt Banksian Medal.

To W. Voss, Esq., Rayleigh, Essex, for fruit.

Award of Merit.

To Apple ' Madresfield Court,' from Mr. J. Carloss, Worcester. Fruit of medium size, conical, about 2½ inches high and wide, regular in outline ; skin pale green, deeply flushed with red on the exposed side ; flesh yellow, very tender, crisp, juicy, and of excellent flavour. Eye small, closed, set in very shallow basin ; stalk about ½ inch long, slender, set in moderate cavity. A very good dessert apple for use in November, raised from ' Worcester Pearmain ' crossed with ' Ribston Pippin.' The tree is described as vigorous, healthy, and a free bearer, with the peculiarity that each fruit hangs eye downwards from a slender stalk. (Fig. 121.)

Other Exhibits.

Mr. H. Anquetil, Sevenoaks : Apple ' Anquetil Aromatic.'

Mr. H. Ballington, Matlock : Apple ' Matlock's Recruit.'

Mrs. Blakeborough, Lincoln : Apple seedling.

A. Butcher, Esq., Banbury: seedling from Apple 'Blenheim Orange.'

Messrs. Laxton, Bedford: Apples and Pears.

I. Simpson, Esq., Ilkeston: Apple 'Simpson's Seedling.'

Wm. Wilmot, Esq., Langley Mill: Apple 'Mrs. Wilmot's Seedling.'

Fruit and Vegetable Committee, November 23, 1915.

Mr. C. G. A. Nix in the Chair, and twelve members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Westmacott, London, for South African jams &c.

Award of Merit.

To Quince 'Vranja' (subject to the tree being seen in fruit next year), from Earl Ducie, Tortworth Court, Falfield. Fruit very large, pyriform; skin smooth, bright yellow. This variety is stated to be a strong grower and very prolific. It was imported some years ago from Serbia by the exhibitor. The fruit is said to keep months longer than that of other varieties grown in this country.

Other Exhibits.

Mr. E. A. Bunyard, Maidstone: Apple jam.

Mr. A. F. Hills, Penshurst: Apples.

Mr. Mason, Royston: seedling Apple.

Fruit and Vegetable Committee, December 7, 1915.

Mr. Jos. Cheal, V.M.H., in the Chair, and eleven members present.

Awards Recommended:—

Silver Banksian Medal.

To Miss Ball, Old Southgate, for jams and marmalade.

To Mrs. Miller, Marlow, for confections.

To Messrs. Westmacott, London, for South African preserves.

Other Exhibits.

Miss Annand, Guildford: *Diospyros Kaki.*

The Rt. Hon. Lord Devonport, Marlow: Apple 'Devonport's Seedling.'

T. Jackson, Esq., Shrewsbury: Grapes.

J. W. Wilson, Esq., South Cave: seedling Apple.

FLORAL COMMITTEE.

SEPTEMBER 14, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended:

Silver-gilt Banksian Medal.

To Reginald Cory, Esq., Duffryn, for Dahlias.
To Messrs. Dobbie, Edinburgh, for Dahlias.

Silver Flora Medal.

To Messrs. Paul, Waltham Cross, for Roses.
To Mr. J. B. Riding, Chingford, for Dahlias.
To Mr. W. Wells, junr., Merstham, for Delphiniums.
To Mr. J. T. West, Brentwood, for Dahlias.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Dobbie, Edinburgh, for Sweet Peas.
To Messrs. H. J. Jones, Lewisham, for Asters and Phloxes.
To Messrs. H. B. May, Edmonton, for Bouvardias.
To Mr. G. Reuthe, Keston, for miscellaneous plants.
To Mr. L. R. Russell, Richmond, for cut foliage.
To Messrs. T. S. Ware, Feltham, for Dahlias.

Bronze Flora Medal.

To Messrs. W. Cutbush, Highgate, for hardy flowers.
To Messrs. Carter Page, London Wall, for Dahlias.

Award of Merit.

To *Ceanothus* 'Fantaisie' (votes unanimous), from Elizabeth, Lady Lawrence, Dorking. This variety has a large, dense head of flowers; the general tone is dull silvery rose-mauve; the stalks are rosy. (Fig. 123.)

To Dahlia 'Blaze' (votes unanimous), from Messrs. James Carter, Raynes Park. A Decorative variety. Flower 6 inches in diameter, dull red, standing well above the foliage on stiff stems.

To Dahlia 'Coyness' (votes unanimous), from Messrs. J. Burrell, Cambridge. A Cactus variety. Flower 5 inches in diameter, pale pink, centre white.

To Dahlia 'Constance' (votes unanimous), from Messrs. J. Burrell, Cambridge. A Cactus variety with flowers 7 inches in diameter, rose-pink, substance very good.

To Dahlia 'Crescent' (votes unanimous), from Messrs. J. Stredwick, St. Leonards. A Cactus variety. Flower pink, with white tip and light gold green base to florets.

To Dahlia 'Cresset' (votes 6 for, 3 against), from Messrs. J. Burrell, Cambridge. A Collerette variety Flower reddish-purple with slight white markings at edge of florets. Collar purple and white.

To Dahlia 'Curlew' (votes unanimous), from Messrs. J. Burrell, Cambridge. A Cactus variety having rose-pink flowers and incurved florets.

To Dahlia 'Don Juan' (votes 6 for, 1 against), from Reginald Cory, Esq., Duffryn. A Collerette variety with a scarlet and white collar.

To Dahlia 'Esmée' (votes unanimous), from Messrs. J. Burrell, Cambridge. A Cactus variety having lemon-yellow flower.

To Dahlia 'Gossamer' (votes 4 for, 2 against), from Messrs. J. Stredwick, St. Leonards. A Cactus variety. Flower 5 inches in diameter, clear deep yellow.

To Dahlia 'A. R. Perry' (votes unanimous), from Messrs. J. Stredwick, St. Leonards. A Cactus variety with much incurved florets. Colour dull rose, with a gold tip and yellowish base to florets.

To Dahlia 'Sappho' (votes unanimous), from Reginald Cory, Esq., Duffryn. A Single Decorative variety. Flower 4 inches in diameter, terra-cotta flushed with light rose; stands well above foliage.

To Dahlia 'Tipperary' (votes unanimous), from Reginald Cory, Esq., Duffryn. A Single Decorative variety. Flower medium size, brilliant crimson, with white-tipped florets.

To Dahlia 'Vanesse' (votes 6 for), from Messrs. J. Burrell, Cambridge. A small Pompon variety. Flower regular in shape, white.

To Dahlia 'William Pound' (votes unanimous), from Mr. S. H. Cooper, Chippenham. A Pompon variety. Flower small, compact, colour a striking primrose yellow.

To *Polypodium Dryopteris plumosum* (votes unanimous), from Mr. T. G. H. Eley, Burgess Hill, Sussex. This is a plumose variety of the native *Dryopteris*, found on Whitbarrow Scar, Westmorland. The colour is a shade lighter than the type; the fronds and pinnules are broader; the latter have a disposition to overlap. (Fig. 124.)

N.B.—The above awards to Dahlias were recommended by a Joint Committee of the R.H.S. Floral Committee and the National Dahlia Society.

Other Exhibits.

Messrs. Cheal, Crawley: flowering shrubs.
Messrs. Dobbie, Edinburgh: Mair's Seedling Gladioli.
Misses Hopkins, Shepperton: rock plants.
Messrs. Low, Bush Hill Park: Statices.
Mr. Charles Turner, Slough: Crab apples.

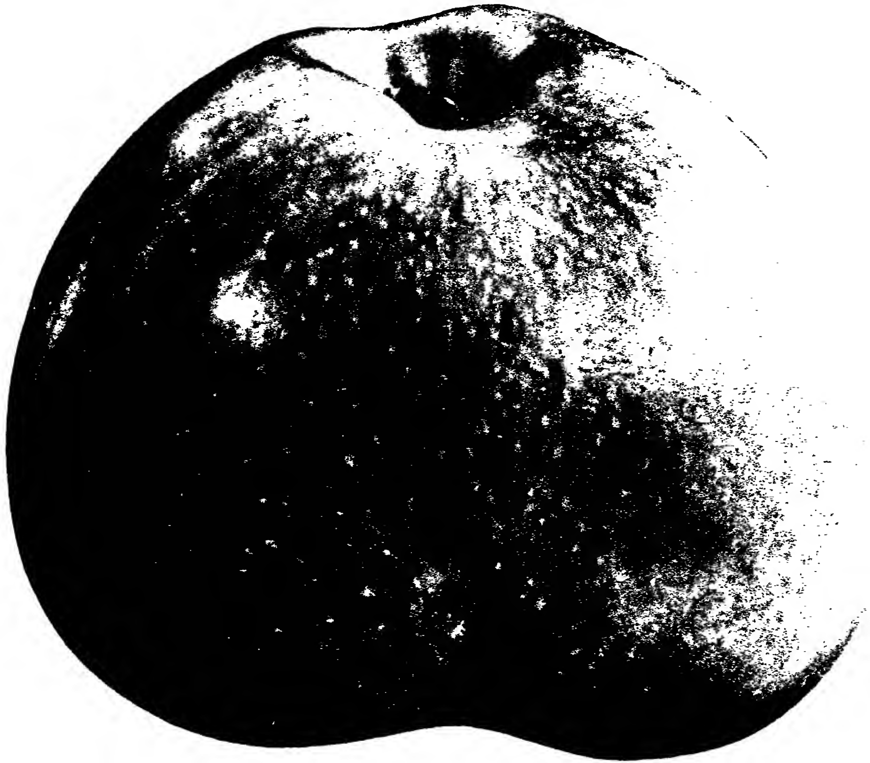


FIG. 119.—APPLE 'EDWIN BECKETT.' (p. cciii.)

[To face p. ccviii.

FIG. 120.—APPLE 'EDWIN BECKETT' (p. cciii.)

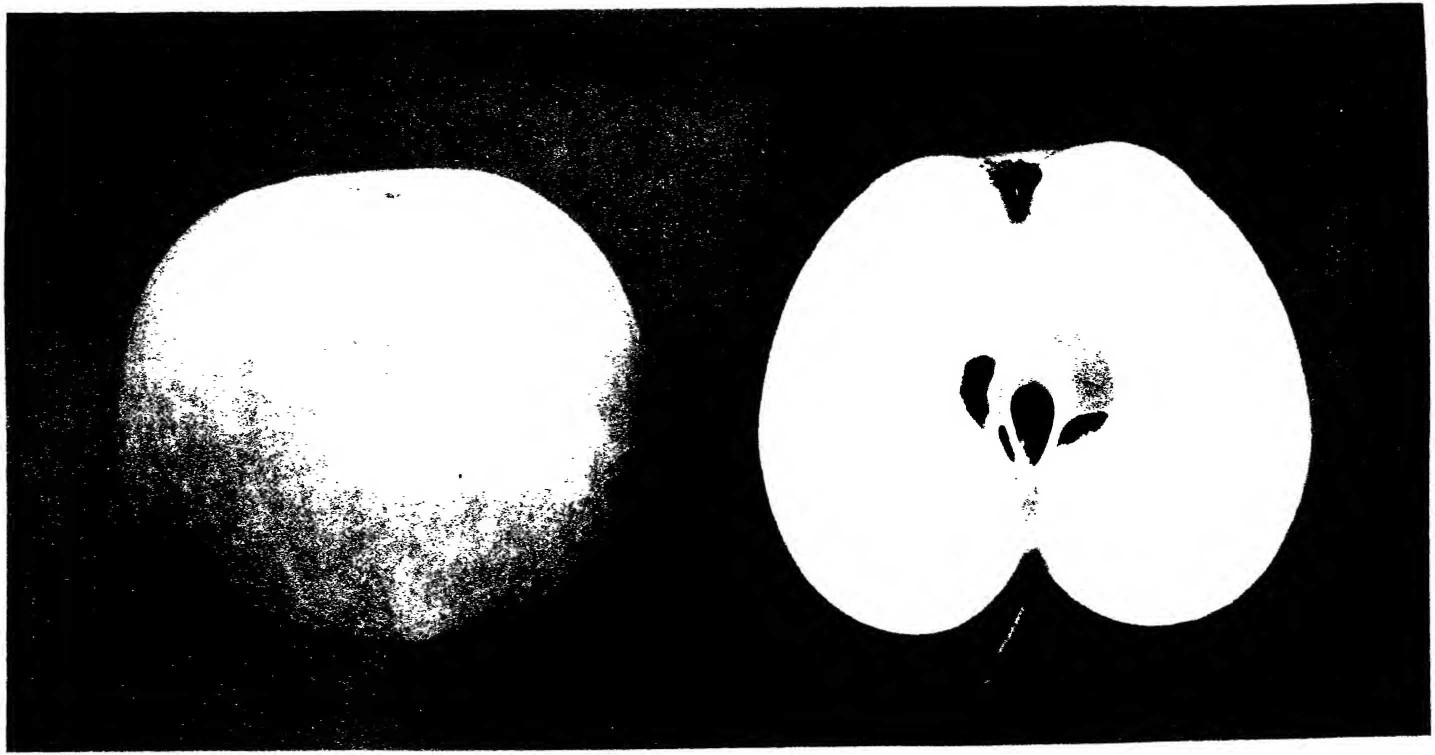


Fig. 121.—Apple 'Madresfield Court.' (p. ccv.)

FIG. 122.—PYRUS JAPONICA WILSONII.

This fine acquisition to the hardy shrub border received an Award of Merit under the name Cydonia Mallardii, on August 31, 1915. (See p. cxxxii.) The present is the correct name.

FIG. 123.—CEANOTHUS 'FANTAISIE.' (*Gard. Mag.*) (p. ccvii.)

FIG. 124. POLYPODIUM DRYOPTERIS PLUMOSUM. (*Gard. Chron.*) (p. ccviii.)

FIG. 125.—PHYLLITIS SCOLOPENDRIUM PLUMOSA, PERRY'S VAR. (*Gard. Mag.*) (p. ccxii.)

FIG. 126.—PHYLLITIS SCOLOPENDRIUM CRISPA SPECIOSA (*Gard. Mag.*) (p. ccxiii.)

[To face p. ccix

FLORAL COMMITTEE, SEPTEMBER 28, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Gold Medal.

To Lady Nunburnholme, Warter Priory, York (gr. Mr. F. Jordan), for *Ixora coccinea*.

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. H. J. Jones, Lewisham, for Asters.

To Mr. J. B. Riding, Chingford, for Dahlias.

Silver Flora Medal.

To Mr. E. Ballard, Colwall, for Asters.

To Messrs. Dobbie, Edinburgh, for Chrysanthemums.

To Mr. G. W. Miller, Wisbech, for hardy flowers.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Messrs. W. Wells, Merstham, for Chrysanthemums.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. James Box, Lindfield, for hardy flowers.

To Messrs. Bunyard, Maidstone, for hardy flowers.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. Cheal, Crawley, for Dahlias and ornamental trees and shrubs.

To Messrs. Stuart Low, Enfield, for Carnations.

To Messrs. H. B. May, Edmonton, for Veronicas and Bouvardias.

To Messrs. J. Piper, Bayswater, for climbing plants and shrubs.

To Messrs. T. S. Ware, Feltham, for Dahlias.

To Mr. W. Wells, Junr., Merstham, for hardy flowers.

To Mr. J. T. West, Brentwood, for Dahlias.

Bronze Banksian Medal.

To Mr. H. Bannister, Royston, for *Salvia splendens*.

To Messrs. W. Cutbush, Highgate, for hardy flowers.

To Rev. J. H. Pemberton, Romford, for Roses.

To Messrs. Waterer, Sons, & Crisp, Twyford, for Asters.

Award of Merit.

To *Abutilon* 'Triumph' (votes unanimous), from Mr. C. Turner, Slough. A very good hybrid. Flowers large, pale dull pink, consisting of two rows of petals, with darker veins. Centre milk white, slightly tinged green.

To *Aster* 'King Albert' (votes 12 for, 6 against), from Mr. E. Ballard, Colwall. Flowers completely double, over an inch across, dull violet, borne in very large trusses; about 2 feet high.

To *Ceanothus* 'George Simon' (votes 20 for), from Messrs. J. Cheal, Crawley. Trusses, much branched, erect, bearing a profusion of deep rose-coloured flowers, very showy. The leaves are small, narrow, acute, and pale green. Flower stems slightly tinged red.

To Dahlia 'Carron' (votes 4 for, 1 against), from Messrs. Dobbie, Edinburgh. A large-flowered Collerette variety, with a distinct collar, composed of narrow yellowish segments, with red markings. Florets scarlet, with yellow tips.

To Dahlia 'Diamond' (votes unanimous), from Mr. J. T. West, Brentwood. A Decorative single variety. Flowers 7 inches across, deep velvety crimson. Stem long and fairly stiff.

To Dahlia 'Erin' (votes unanimous), from Messrs. J. Burrell, Cambridge. A Cactus variety. Flower 5 inches across, golden brown.

To Dahlia 'Garland' (votes unanimous), from Messrs. J. Stredwick, St. Leonards. A Collerette variety. Collar composed of many long, erect, yellow florets, with crimson markings. Flower deep crimson.

To Dahlia 'Landmark' (votes unanimous), from Mr. J. T. West, Brentwood. A Collerette variety, quite distinct. Florets crimson, with yellow tips and edges. Collar bright yellow, splashed with crimson.

To Dahlia 'Madonna' (votes unanimous), from Messrs. T. S. Ware, Feltham. A very large Decorative variety. Flowers nearly pure white, 9 inches across, some specimens much larger, borne on stiff, erect stems.

To Dahlia 'Saucy' (votes 4 for, 1 against), from Mr. J. T. West, Brentwood. A large Collerette variety. Flowers very pale yellow, with a striking yellow centre. Stems fairly stout and stiff.

To Dahlia 'Sceptic' (votes 4 for), from Messrs. J. Stredwick, St. Leonards. A Cactus variety. Flowers fairly large, loose; florets purple, shading to brown at the bases.

To Dahlia 'Searchlight' (votes 5 for), from Messrs. J. Stredwick, St. Leonards. A Cactus variety with incurved and spirally twisted florets. Flower 4 inches across, pale lemon yellow.

To Dahlia 'Ursa Major' (votes unanimous), from Messrs. J. Stredwick, St. Leonards. A Cactus variety. Florets golden, much marked with crimson.

Escallonia montevidensis (syn. *floribunda*) (votes 9 for, 3 against), from Miss Willmott, Warley Place. A shrubby plant, said to grow 10 to 12 feet high. The flowers are white, borne in terminal conical clusters on the side shoots. Ovary is shining greenish black; stamens prominent, golden yellow. Leaf ovate, glossy deep green. Introduced in 1827.

Nerine 'Rosebud' (votes 18 for, 1 against), from Messrs. Barr, Covent Garden. Flowers borne in umbels, dark rose, shaded lighter towards the base from the middle. A very attractive plant.

Nerine 'Vivid' (votes unanimous), from Messrs. Barr, Covent

Garden. Flowers borne on long, stout, fairly erect stems, about ten to a head, bright scarlet.

Rose 'Hadley' (votes unanimous), from Messrs. Stuart Low, Bush Hill Park. A Hybrid Perpetual variety, very like 'Fisher Holmes.' The flower is highly scented and deep velvety crimson.

Note.—The above awards to Dahlias were recommended by a Joint Committee of the R.H.S. Floral Committee and the National Dahlia Society.

Other Exhibits.

Messrs. Barr, Covent Garden: Nerines.
Messrs. G. & A. Clark, Dover: hardy plants.
Mr. G. Reuthe, Keston; hardy flowers.
Mr. Elisha Hicks, Hurst: Roses.
The Misses Hopkins, Shepperton: rock plants.

Floral Committee, October 12, 1915.

Mr. H. B. May, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Cheal, Crawley, for a group of Conifers.

To the Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for ornamental fruits.

Silver-gilt Flora Medal.

To Messrs. H. J. Jones, Lewisham, for Asters.

Silver Flora Medal.

To Messrs. Ben Cant, Colchester, for cut Roses.
To Messrs. Carter Page, London Wall, for Dahlias.
To Messrs. J. Piper, Bayswater, for Climbers, Chinese plants, &c.

Silver Banksian Medal.

To Messrs. Wm. Cutbush, Highgate, for Asters.
To Messrs. Dobbie, Edinburgh, for Dahlias.
To Messrs. Stuart Low, Bush Hill Park, for Begonias and Roses.
To Messrs. H. B. May, Edmonton, for Scolopendriums.
To Rev. Jos. H. Pemberton, Romford, for cut Roses.
To Mr. John Pigg, Royston, for Roses.
To Mr. James B. Riding, Chingford, for Dahlias.
To Mr. L. R. Russell, Richmond, for berried plants.

Silver Flora Medal.

To Messrs. Allwood Bros., Haywards Heath, for Carnations.
To Mr. Elisha Hicks, Twyford, for Roses.
To Messrs. W. Wells, Merstham, for Chrysanthemums.
To Messrs. Wells, Junr., Merstham, for miscellaneous plants.

Bronze Banksian Medal.

To Messrs. Barr, Covent Garden, for Nerines.

To Messrs. Clark, Dover, for Asters.

To Messrs. Harkness, York, for Roses.

To Mr. G. Reuthe, Keston, for miscellaneous plants.

Award of Merit.

To *Aster Amellus* 'Mr. Perry' (votes unanimous), from Mr. Amos Perry, Enfield. Plant dwarf, much branched, densely flowered. Flower violet purple, disc florets red brown; diameter little over an inch.

To Carnation 'Alice' (votes 12 for), from Messrs. Stuart Low. A perpetual-flowering variety; petals rather long, wavy; calyx very stout; colour pink. Bloom fairly large, of very good form and substance.

To *Crocus pulchellus albus* (votes 11 for), from Messrs. Barr, Covent Garden, and Mr. G. Reuthe, Keston. Flowers small, milk white, of delicate appearance, slightly splashed at the base with gold; stigma bright golden yellow. Cup about 1¼ inch long, borne on a pale slender stem.

To Dahlia 'Anna Louise' (votes unanimous), from Mr. Jas. B. Riding, Chingford. A Collerette variety. Flower 4 inches in diameter, of good shape, reddish brown. Stem fairly stout.

To Dahlia 'Leviathan' (votes unanimous), from Messrs. J. Stredwick, St. Leonards. A giant Decorative variety. Flower 8 inches across; petals long, rather loose, terra-cotta, shaded with bronzy purple. Stem rather short, fairly stout.

To Dahlia 'Rainbow' (votes unanimous), from Mr. J. A. Jarrett, Anerley Road, S.E. A Collerette variety with a pale-yellow collar. Flower 5 inches in diameter. Centre yellow, passing through terra-cotta to purple pink and fading off to white tips.

Rose 'Mrs. John Foster' (votes 11 for, 4 against), from Mr. Elisha Hicks, Twyford. A beautiful Hybrid Tea variety. Flower of good shape, very fragrant, deep crimson. Stem fairly stout; foliage pale.

To *Rubus Veitchii* (votes unanimous), from Messrs. J. Piper, Bayswater. This was exhibited as a pot specimen, about 4 feet high. Stem branched, spiny; foliage pinnate, about 2 inches long, with three pairs of pinnules, ending in a wedge-shaped petiole; the whole having a silver-grey tone.

Phyllitis Scolopendrium plumosa 'Perry's var.' (votes unanimous), from Mr. Amos Perry, Enfield. A crested variety of the native Hart's Tongue Fern, bearing dark-green fronds which are beautifully divided along the margins, with tasselled tips. (Fig. 125.)

Cultural Commendation.

For spikes of *Eucomis punctata* exhibited by Reginald Cory, Esq., Duffryn (gr. Mr. A. J. Cobb).

Other Exhibits.

Messrs. Allwood Bros., Haywards Heath: Perpetual Carnations 'Highland Lassie' and 'Rosalind.'

Misses Hopkins, Shepperton: rock plants.

Messrs. Perry, Enfield: *Gentiana Veitchiorum*, **A.M.** Aug. 1909.

Messrs. J. Piper, Bayswater: Dahlias.

Misses Price and Fyfe, East Grinstead: Chrysanthemums.

Allen Tatham, Esq., Nottingham: 'Carnation Warrior.'

Messrs. W. Wells, Junr., Merstham: *Aster Novi Belgii* 'J. W. Crossfield' and *Dianthus* 'Mary Middleton.'

Floral Committee, October 26, 1915.

Mr. H. B. May, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Jones, Lewisham, for Asters and Chrysanthemums.

Silver Flora Medal.

To Mr. Norman Davis, Framfield, for Chrysanthemums.

To Messrs. Carter Page, London Wall, for Dahlias.

To Mr. L. R. Russell, Richmond, for ornamental shrubs.

To Messrs. R. Wallace, Colchester, for shrubs.

Silver Banksian Medal.

To Messrs. J. Cheal, Crawley, for ornamental foliage.

To Messrs. Stuart Low, Bush Hill Park, for Carnations and Begonias.

To Messrs. H. B. May, Edmonton, for Begonias and Ferns.

To Mr. Jas. B. Riding, Chingford, for Dahlias.

To Messrs. W. Wells, Merstham, for Chrysanthemums.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Wm. Cutbush, Highgate, for greenhouse plants.

To Messrs. Godfrey, Exmouth, for Chrysanthemums.

To Messrs. J. Piper, Bayswater, for Fuchsias and berried plants.

To Mr. G. Reuthe, Keston, for miscellaneous plants.

First-class Certificate.

To *Phyllitis Scolopendrium crispa speciosa* (votes unanimous), from W. B. Cranfield, Esq., Enfield. A beautiful crested form of the common Hart's-tongue fern. The fronds are pleated almost to the midrib, and waved at the margins. Each pleat is arched, very regular, like a goffered ruffle. The plant was a fine specimen, bearing over fifty fronds, all about 2 feet long. (Fig. 126.)

Award of Merit.

To Carnation 'Aviator' (votes 14 for), from Messrs. W. Wells & Co., Merstham. Flowers fairly large, of good scarlet colour; stem rather short.

To Chrysanthemum 'Charlotte E. Soer' (votes 10 for, 4 against), from Martin Silsbury, Esq., Shanklin, Isle of Wight. A fairly large exhibition Japanese variety. Florets deep, clear, yellow, with some rosy-purple markings at the base of the older florets.

To Chrysanthemum 'Bertha Fairs' (votes 14 for, 1 against), from Mr. Norman Davis, Framfield. A beautiful single variety, very floriferous. Florets reddish bronze, passing to gold at the base. Flower 3 inches in diameter, set on stout stems.

To Chrysanthemum 'Market Bronze' (votes 14 for, 4 against), from Mr. Norman Davis, Framfield. A reflexed Japanese variety. Flowers of medium size; florets gold at the base, suffused with bronze.

To Chrysanthemum 'General Smith-Dorrien' (votes 16 for), from Messrs. W. Wells & Co., Merstham. A large exhibition Japanese variety. Florets reddish-chestnut, with golden reverse. Flower broad, of very good shape.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations 'The Major' and 'Niobe.'

The Hon. Vicary Gibbs, Aldenham: Aster 'The President.'

The Misses Hopkinson, Shepperton: rock plants.

Mr. J. J. Kettle, Corfe Mullen: Violets.

Elizabeth Lady Lawrence, Burford: *Coprosma burfordensis.*

Mr. Thos. Stevenson, Addlestone: Chrysanthemum 'Tom Wren.'

F. C. Stoop, Esq., Byfleet: Chrysanthemum 'Byfleet Yellow.'

Messrs. J. Stredwick, St. Leonards: Chrysanthemum 'Rev. H. W. Edwards.'

H. Wilson, Esq., Ashtead: *Stapelia* sp.

Floral Committee, November 9, 1915.

Mr. H. B. May, V.M.H., in the Chair, and sixteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Jones, Lewisham, for Chrysanthemums.

To Messrs. Stuart Low, Bush Hill Park, for winter-flowering Begonias and Carnations.

Silver-gilt Banksian Medal.

To Messrs. J. Piper, Bayswater, for ornamental shrubs.

Silver Flora Medal.

To Messrs. Godfrey, Exmouth, for Chrysanthemums.
To Messrs. Malby, Woodford, for photographs.
To Messrs. H. B. May, Edmonton, for greenhouse ferns.

Silver Banksian Medal.

To Messrs. J. Cheal, Crawley, for ornamental foliage.
To Messrs. Felton, Hanover Square, for *Solanum ciliatum*.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Mr. J. J. Kettle, Corfe Mullen, for Violets.
To Mr. G. Reuthe, Keston, for miscellaneous plants.

Award of Merit.

To Begonia 'Fireflame' (votes 15 for, 2 against), from Messrs. Stuart Low, Bush Hill Park. A winter-flowering variety of very good, compact habit. The flowers are orange-rose, passing to glowing rose at the edge of the petals, 2 inches across; the unopened buds are cerise, marked with scarlet-rose.

To Chrysanthemum 'Edith Cavell' (votes 11 for), from Messrs. Wells & Co., Merstham. A very beautiful Japanese variety. Flowers 4 inches across; florets gold, suffused with crimson, giving a red terra-cotta appearance; underside gold, which gives a pretty effect, as some of the florets near the centre roll back. Stems fairly stout and stiff.

To Chrysanthemum 'Golden Champion' (votes 11 for, 2 against), from Messrs. Wells & Co., Merstham. A large Japanese exhibition variety. Florets incurved, very long, lemon-yellow, underside sulphur-yellow. Stem stout, not very stiff.

To Chrysanthemum 'Phyllis Cooper' (votes unanimous), from Mr. Philip Ladds, Swanley Junction. A single-flowered variety; florets yellow, rather narrow and stiff. Stem long and stiff, holding the flower erect.

To *Solanum ciliatum* (syn. *S. aculeatissimum*) (votes unanimous), from Messrs. R. F. Felton, Hanover Square. Stems about 4 feet long, stout, ribbed, very spinous, green, bearing many dull red berries about 2 inches in diameter, which are said to hang for a long period. The plants shown were raised from seed of imported fruits. Received **S.C.C.** June 7, 1871.

Other Exhibits.

Messrs. Barr, Covent Garden: Nerines.
Messrs. G. & A. Clark, Dover: Chrysanthemum 'Pink Favourite.'
Messrs. Godfrey, Exmouth: Chrysanthemum Mrs. W. J. Godfrey.'
Misses Hopkins, Shepperton: rock plants.
Mr. T. A. Weston, Orpington: *Eupatorium Purpusii* and *Stevia paniculata*.

FLORAL COMMITTEE, NOVEMBER 23, 1915.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Gold Medal.

To Misses Tate and Tanner (gr. Mr. Streeter), Bushey Heath, for winter-flowering Begonias.

Silver-gilt Flora Medal.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for Begonias.
To Mr. A. Perry, Enfield, for Polystichums.
To Messrs. Piper, Bayswater, for trees and shrubs.

Silver Banksian Medal.

To Mr. L. R. Russell, Richmond, for shrubs.
To Mr. Malby, for photographs of fruits and flowers

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cannell, Eynsford, for Pelargoniums.
To Messrs. Cutbush, Highgate, for Lilies and Heaths.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs.
To Mr. A. F. Dutton, Iver, for Carnations.

Award of Merit.

To Carnation 'Louvain' (votes 11 for, 1 against), from Mr. A. F. Dutton, Iver. A perpetual-flowering variety with large, bright cerise-pink flowers, shaded with salmon. There is a slight perfume to the flowers, and the calyces are non-bursting.

To Chrysanthemum 'Aristocrat' (votes 16 for), from Mr. N. Davis, Framfield. A very decorative single variety. The blooms are deep yellow and have several rows of florets. The width of the blooms is nearly 5 inches.

To Chrysanthemum 'Louisa Pockett' (votes 13 for), from Messrs. Wells, Merstham. This is an exceptionally large white Japanese variety, with curled florets.

To Chrysanthemum 'Monica Mitchell' (votes 11 for, 5 against), from Mr. N. Davis, Framfield. The flowers of this variety are single and of a dull garnet colour. The golden centre is surrounded by a narrow ring of yellow.

Other Exhibits.

Messrs. Felton, London: *Solanum ciliatum.*
Miss Hopkins, Shepperton: hardy plants.
Messrs. S. Low, Enfield: Begonias.
Mr. G. Reuthe, Keston: hardy plants.
Mr. H. Woolman, Shirley: Chrysanthemums.

Floral Committee, December 7, 1915.

Mr. H. B. May, V.M.H., in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Low, Bush Hill Park, for Carnations.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

To Messrs. Piper, Bayswater, for shrubs.

Bronze Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations &c.
To Misses Price and Fyfe, Edenbridge, for Carnations and Chrysanthemums.
To Mr. L. R. Russell, Richmond, for shrubs.

Award of Merit.

To Carnation 'Malcolm' (votes 11 for, 1 against), from Misses Price and Fyfe, Edenbridge. A bright cerise-pink perpetual-flowering variety, of good substance, with a slight scent and non-bursting calyces.

To Chrysanthemum 'Flossy' (votes unanimous), from Messrs. Wells, Merstham. The blooms of this large single white variety measure nearly 5 inches across, and are borne on very stiff, erect stems.

To Chrysanthemum 'James Fraser' (votes 12 for), from Messrs. Wells, Merstham. A very large yellow Japanese variety with long, narrow, curled florets.

Other Exhibits.

Miss Hopkins, Shepperton: hardy plants.
Messrs. Larcombe, Broadstone: Chrysanthemum 'Larcombe's Yellow.'
Mr. G. Reuthe, Keston: hardy plants.
Mr. G. West, Datchet: Carnations.
Mr. F. L. Westron, Newbury: Chrysanthemum 'Marlston Tints.'

ORCHID COMMITTEE.

September 14, 1915.

Mr. J. Gurney Fowler in the Chair, and eighteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Stuart Low, Jarvisbrook, for a group.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for rare hybrids.

To Messrs. McBean, Cooksbridge, for Odontoglossums, Laelio-cattleyas, &c.

To Messrs. Sander, St. Albans, for hybrids and rare species.

First-class Certificate.

To *Cattleya* × 'Venus' var. 'Princess Mary' (*Iris* × *Dowiana aurea*) (votes unanimous), from Messrs. Charlesworth. A large flower with golden-yellow sepals and petals and broad ruby-red lip.

Award of Merit.

To *Dendrobium Hookerianum*, Fowler's variety (votes unanimous), from J. Gurney Fowler, Esq. A remarkable variety with fringed petals and lip. Described in "Gardeners' Chronicle," Sept. 19, 1914, p. 200. Flowers in drooping racemes, yellow, with dark claret blotches on the lip.

Preliminary Commendation.

This provisional award was given to *Cattleya* × *Ashtoniae alba* (*O'Brieniana alba* × *Dusseldorfei* 'Undine'), a small plant of which was shown by Messrs. Armstrong & Brown, Tunbridge Wells. Flower of fine form, pure white.

Other Exhibits.

J. Gurney Fowler, Esq.: new hybrids.
R. G. Thwaites, Esq.: Cattleyas.
Messrs. Armstrong & Brown: hybrids.
Messrs. Flory & Black: Brassocattleyas &c.

Orchid Committee, September 28, 1915.

Mr. J. Gurney Fowler in the Chair, and seventeen members present.

Awards Recommended :—

Silver Lindley Medal.

To Messrs. Sander, St. Albans, for a specimen of *Vanda Sanderiana* with six spikes bearing together forty-two flowers, and one spike in bud.

Silver Banksian Medal.

To Dr. Miguel Lacroze, Roehampton Lane (gr. Mr. Cresswell), for a group in which the *Odontoglossum grande* bore about forty spikes.

To H. T. Pitt, Esq. (gr. Mr. Thurgood), for a group.

To R. G. Thwaites, Esq. (gr. Mr. Hannington), for hybrids.

To Messrs. J. Cypher, for a group.

To Messrs. Charlesworth, for a group.

To Messrs. Sander, for hybrids and species.

To Messrs. McBean, for a group.

To Messrs. Stuart Low, for showy Oncidiums &c.

First-class Certificate.

To *Cattleya* × 'Lady Veitch' (*Luddemanniana alba* × *Warneri alba*) (votes unanimous), from Messrs. Sander, St. Albans. Flowers pure white, with lemon-yellow disc to the lip, which has a more tubular base than the *labiata* section.

To *Cattleya* × 'King George' (*triumphans* × *Dowiana* 'Rosita') (votes unanimous), from Messrs. Flory & Black, Slough. Nearest to *C. Dowiana* in form and colour. Sepals and petals yellow; lip mulberry-red, with a tracery of gold lines.

Award of Merit.

To *Brassocattleya* × 'Mars' (*C.* × 'Maggie Raphael' *alba* × *B.-c.* × 'Mrs. J. Leemann') (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Flowers of good shape, white, with rose-pink lip and yellow disc.

Other Exhibits.

Sir Jeremiah Colman, Bt.: hybrid Orchids.

Pantia Ralli, Esq.: *Vanda coerulea*, Ashtead Park variety.

E. R. Ashton, Esq.: *Cattleya Iris*, with eleven flowers.

H. F. Goodson, Esq.: *Odontoglossum* × *Goodsonianum*.

Messrs. Armstrong & Brown: hybrids.

Messrs. Hassall: Cattleyas &c.

Messrs. Flory & Black: hybrids.

Orchid Committee, October 12, 1915.

Mr. J. Gurney Fowler in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for a group of hybrids.

To Messrs. Sander, St. Albans, for a group including some rare species.

Silver Banksian Medal.

To Dr. Miguel Lacroze, Roehampton (gr. Mr. Cresswell), for a group of *Odontoglossum grande.*

To Messrs. Stuart Low, Jarvisbrook, for a group.
To Messrs. Hassall, Southgate, for hybrid Cattleyas.

Award of Merit.

To *Cattleya* × 'Ajax' var. 'Primrose Dame' (*Armstrongiae* × *Dowiana aurea*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Flowers primrose-yellow, darker in the centre of the lip, which has dark purple markings at the base.

Preliminary Commendation.

To Messrs. Armstrong & Brown for *Odontoglossum* × 'Victory' (*crispum* 'The Baroness' × hybrid unrecorded). The small seedling bore one flower of perfect shape and large size, mahogany-red, with a broad white margin to the segments.

Cultural Commendation.

To Mr. Collier (gr. to Sir Jeremiah Colman, Bt.), for *Cattleya* × *Browniae*, Gatton Park variety (*Bowringiana* × *Harrisoniana*), with two spikes bearing together twenty-seven flowers.

Other Exhibits.

J. Gurney Fowler, Esq.: four rare hybrids.
R. G. Thwaites, Esq.: *Cattleya* × 'Venus' var. 'Her Majesty.'
Messrs. Flory & Black, Slough: *Laelia pumila alba.*

ORCHID COMMITTEE, OCTOBER 26, 1915.

Mr. J. GURNEY FOWLER in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To J. Gurney Fowler, Esq., Brackenhurst, Pembury, for new and rare Orchids.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

To Messrs. Sander, St. Albans, for a group, principally of forms of *Cattleya* × 'Fabia.'

To Messrs. Stuart Low, Jarvisbrook, for a group.

To Messrs. Hassall, Southgate, for hybrid Cattleyas.

To Messrs. McBean, Cooksbridge, for a group.

First-class Certificate.

To *Cattleya* × *Luegeae*, Fowler's variety (*Dowiana aurea* × 'Enid') (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury. Flowers bright rose-purple. Lip broad, ruby-red, with yellow disc. The spike bore four large flowers.

Award of Merit.

To *Cattleya* × 'Moira' *rubra* ('Fabia' × *Mantinii*), (votes unanimous), from Messrs. Hassall, Southgate. Resembling *C. Mantinii*, but an improvement on it in size and colour, which is rose-purple with claret-red lip.

Other Exhibits.

Sir Jeremiah Colman, Bt.: Cattleyas &c.

Elizabeth, Lady Lawrence: *Laeliocattleya* × 'Anzac' ('Clive' × *bletchleyensis*).

Pantia Ralli, Esq.: *Sophrolaeliocattleya* × *ashteadensis* (*S.-c. pumeximia* × *C. Bowringiana*).

H. T. Pitt, Esq.: *Brassocattleya* × 'William Pitt.'

R. G. Thwaites, Esq.: *Sophrocattleya* × *Blackii.*

Walter Cobb, Esq.: *Cattleya* × 'Fabia,' Cobb's variety.

Messrs. Flory & Black: × *Laeliocattleya* × *Soulange* (*L.-c.* 'Lustre' × *C. Dowiana aurea*).

Orchid Committee, November 9, 1915.

Mr. J. Gurney Fowler in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Cattleyas &c.

To Messrs. Jas. Cypher, Cheltenham, for Cypripediums, Dendrobiums, and Cattleyas.

To Messrs. Sander, St. Albans, for Cattleyas &c.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, for a group.

To Messrs. McBean, Cooksbridge, for a group.

First-class Certificate.

To *Odontoglossum* × 'Pembury' (*gandavense* × *eximium*) (votes 10 for, 3 against), from J. Gurney Fowler, Esq., Brackenhurst, Pembury. Flowers large, white, with the inner two-thirds of the segments coloured claret-red. The spike bore eleven flowers.

Award of Merit.

To *Vanda luzonica* (votes unanimous), from Messrs. Sander, St. Albans. A new species from the Isle of Luzon, allied to *V. insignis*. Flowers white, with a thin purple line at the base of the segments. Front lobe of the lip violet-purple.

To *Brassocattleya* × 'Admiral Jellicoe,' Broadlands variety (*B.-c.* × *Digbyano-Mossiae* × *C.* × 'Lord Rothschild') (votes 9 for, 3 against), from E. R. Ashton, Esq., Tunbridge Wells. A large flower, light lilac in colour, the disc of the lip yellow.

Preliminary Commendation.

To *Odontoglossum* × 'Doris' *nobilior* (*Ossulstonii* × *crispum*), from Messrs. Armstrong & Brown, Tunbridge Wells. A promising seedling with one large and perfectly shaped flower, which is white, with heavy claret-coloured blotches.

Other Exhibits.

J. Gurney Fowler, Esq.: new and rare Orchids.

F. M. Ogilvie, Esq.: *Odontioda* × 'Sheila.'

Pantia Ralli, Esq.: *Sophrolaeliocattleya* × 'Serbia.'

Messrs. Armstrong & Brown: *Cirrhopetalum gracillimum* and hybrid Odontoglossums.

Messrs. Flory & Black, Slough: Brassocattleyas.

ORCHID COMMITTEE, NOVEMBER 23, 1915.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for a group of hybrids with *Trichopilia suavis* in front.

To R. Windsor Rickards, Esq., The Priory, Usk, Monmouthshire, for Cypripediums.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group.

To Messrs. J. Cypher, Cheltenham, for Cypripediums.

First-class Certificate.

To *Laeliocattleya* × 'Alex' (*L.-c.* × 'Tunis' × *C. Dowiana aurea*) (votes unanimous), from Messrs. Stuart Low, Jarvisbrook, Sussex. In shape nearest to *C. Dowiana aurea*. Sepals and petals orange colour, with a lilac shade; lip ruby-crimson, with yellow base.

Award of Merit.

To *Laeliocattleya* × 'King Manoel' (parentage unrecorded) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury. A very distinct hybrid, of medium size. Sepals and petals reddish-orange colour. Lip deep blood-red in front, the narrow middle part yellow, the base crimson, with yellow lines.

To *Cypripedium* × 'Mrs. Rickards' ('Earl of Tankerville' × unknown) (votes unanimous) from R. W. Rickards, Esq. A large flower of perfect shape. Dorsal sepal white, with pale green base, and large claret-red blotches. Petals and lip yellow, tinged with purple.

To *Cypripedium* × 'Iona,' Priory variety (*bellatulum* × *Fairrieanum*) (votes 14 for, 0 against), from R. W. Rickards, Esq. Flowers cream-white, heavily tinged and veined with purple. *C. Fairrieanum* appeared more in this than in the original shown by the Duke of Marlborough (A.M. Jan. 7, 1913).

To *Cypripedium* × 'Swallow-tail' (*Fairrieanum* × 'Mons. de Curte') (votes 9 for, 1 against), from R. W. Rickards, Esq. Flower with the decurved petals of *C. Fairrieanum.* Dorsal sepal white, evenly spotted with dark purple.

To *Cattleya* × 'Maggie Raphael,' Sandhurst variety (*Dowiana aurea* × *Trianae*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Sepals and petals white; lip ruby-red, with yellow veining.

Other Exhibits.

J. Gurney Fowler, Esq.: new and rare hybrids.

Sir Jeremiah Colman, Bt.: two hybrids.

R. G. Thwaites, Esq.: *Odontoglossum* × 'Chloë' (*Groganiae* × *crispum*).

F. J. Hanbury, Esq.: *Cattleya* × 'Portiata' ('Portia' × *labiata*).

W. Bolton, Esq.: Cypripediums.

E. Whiteaway, Esq.: *Brassocattleya* × 'William Pitt.'

Messrs. McBean: hybrids.

Messrs. Stuart Low: Cattleyas.

ORCHID COMMITTEE, DECEMBER 7, 1915.

Mr. J. GURNEY FOWLER in the Chair, and seventeen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for winter-flowering Mexican Laelias and hybrids.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for hybrids.

To Messrs. Hassall, Southgate, for Cattleyas, Laeliocattleyas, &c.

To Messrs. Stuart Low, Jarvisbrook, for a group.

Award of Merit.

To *Odontioda* × 'Aphrodite' (*Oda.* × 'Diana' × *Odm.* × *eximium*) (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Flower of good shape, reddish-claret colour, with yellowish tips to the segments, and irregular marginal lines on the petals.

Preliminary Commendation.

To *Odontioda* × *Armstrongiae* (*Oda.* × *Bradshawiae* × *Odm.* × *Armstrongiae*), from Messrs. Armstrong & Brown, Tunbridge Wells. The first flower on a small plant was large and of fine shape, closely freckled with brownish-orange colour on light ground.

Other Exhibits.

Sir Herbert Leon, Bletchley Park (gr. Mr. Cooper): *Laeliocattleya* × *Leoniae* (parentage unrecorded).

Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier): *Laeliocattleya* × 'Epicasta,' 'Gatton Glory.'

F. J. Hanbury, Esq., Brockhurst, East Grinstead (gr. Mr. Matthews): *Laeliocattleya* × *adolphaurea* (*L.-c.* × 'Adolphus' × *C. Dowiana aurea*).

Messrs. Armstrong & Brown: new hybrids.

Mr. H. Dixon: a small group.

Mr. C. F. Waters: Cattleyas and Odontoglossums.

Messrs. Flory & Black: Cypripediums.

Messrs. Sander: *Laeliocattleya* × 'St. Alban' (*L.-c.* × 'Golden Glory' × *C. Dowiana aurea*).

CERTIFICATES FOR DILIGENT INTEREST IN PLANTS.

Certificates for Diligent Interest in Plants have been awarded to the following during 1915 :—

Hilda Howe, 1st in the Waterloo Wesleyan Girls' School Competition for the best kept garden plot.

Ivy Scott, 1st in the Waterloo Wesleyan Girls' School Competition for the best collection of wild flowers.

Also to the following members of the St. Mark's, Birmingham, Amateur Gardening Society :—

For Window-box Gardening :

Mr. A. Hampton.
Mrs. Mitchell.
Mr. H. Grater.
Mr. F. Wardle.
Mr. S. Warren (and garden).
Mr. F. Addiscott.
Mr. W. S. Blewitt (and garden).
Mrs. Johnston.
Mr. W. Bowen (and garden).
Mr. J. Ross.
Mr. A. W. Nixon (and garden).

For the good Upkeep of Back and Front Gardens :

Mrs. Taylor.
Mrs. Cox.
Mr. H. Chapman.
Mr. Jas. Day.
Mr. Wm. Wallace.
Mr. Wm. Cornwall.
Mrs. Millichamp.
Mr. J. Ridgeway.
Mrs. Hunter.
Mrs. Barber.
Mr. S. Frost.
Mr. E. Palfreyman.
Mr. F. Webb.
Mr. S. J. Harper.
Mr. C. Jenkins.
Mr. J. Banks.
Mr. H. Furness.
Mr. L. Roberts.

W. Wilks,
Secretary.

HORTICULTURAL SUNDRIES.

AWARDS MADE IN 1915.*

Winter Washes.

Highly Commended.

† 1. Liquid Gishurst Compound, sent by Price's Candle Co.
2. Jeyes' Winter Wash, sent by Jeyes' Sanitary Compounds Co.
3. Morlar Winter Wash, sent by the S.P. Charges Co., St. Helens.
4. Voss Winter Wash, sent by Messrs. W. Voss, Millwall, E.

Commended.

5. Cooper's Winter Wash (V1), sent by Cooper Nephews, Berkhamsted.
6. Woburn Bordeaux Winter Wash, sent by Messrs. W. Voss, Millwall, E.
7. Evans' Winter Spray, sent by Messrs. Evans, Stratford-on-Avon.
8. Woburn Winter Wash, sent by Messrs. W. Voss, Millwall, E.
9. Acme Winter Wash, sent by the Acme Chemical Co., Tonbridge.

Notes on these washes will be found in the Report of the Trial on pp. 230–233.

Spray Nozzles.

Award of Merit.

10. To a series of nozzles adapted to every class of work. The series included a double swivel nozzle, triflex nozzle, Imperial nozzle, Woodford nozzle, Lightning nozzle, Cheshunt nozzle, Ejector nozzle, No. 169, No. 71, Adjustable nozzle, Bordeaux nozzle, No. 186, Marvellous nozzle, No. 51, and No. 48, sent by Messrs. The Four Oaks Co., Sutton Coldfield.

Highly Commended.

11. To Nozzle No. 3, the best adjustable nozzle in the trial, suited to all classes of work, sent by Messrs. Weeks & Son, 47 High Street, Maidstone.

Commended.

12. To Nozzle F, for liming, from Messrs. Hartjen & Co., Noble Street, E.C.

* These awards stand for 10 years only, and lapse in 1925.

† The order of entry is purely accidental and has no reference to merit.

ESTABLISHED 1804.

INCORPORATED 1809.

TELEGRAMS: "HORTENSIA SOWEST LONDON."

TELEPHONE: VICTORIA 5363.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. Journals Wanted.
2. Subscriptions.
3. Form of Bequest.
4. New Fellows.
5. An Appeal.
6. R.H.S. Gardeners' Diary.
7. The Society's Gardens at Wisley.
8. Rock Garden at Wisley.
9. Students at Wisley.
10. Distribution of Surplus Plants.
11. Spring and Summer Shows.
12. National Diploma in Horticulture.
13. Information.
14. Inspection of Fellows' Gardens.
15. Affiliation of Local Societies.
16. Rules for Judging—1914 Code.
17. Rules for Judging Cottage and Allotment Gardens.
18. R.H.S. Daffodil Year Book.
19. R.H.S. Pamphlets.
20. Tulip Report.
21. Douglas Journal.
22. R.H.S. Publications.
23. Advertisements.

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1. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, the stock of the following is exhausted :—

Vols. I. to VI.	Vol. XIII. Part 1.
Vol. X.	Vol. XIV.

These are, therefore, particularly asked for.

2. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the inconvenience of remembering their subscriptions Fellows may *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

3. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £.........., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

4. NEW FELLOWS.

The increasing number of Fellows shows plainly the useful work the Society is doing, and its value to all lovers of the Garden. The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as it is now more important than ever to fill the places of those who are taken from us.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

See also Footnote, page ccxxix.

5. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by :—

1. Increasing the Number of Fellows.
2. Providing Lectures with Lantern Slides.
3. Presenting Books for the Library at Vincent Square and at Wisley.
4. Sending new or rare Plants and Seeds for the Garden and surplus Roots for distribution to the Fellows.*

6. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1916 contains a considerable quantity of new information, and is compiled more especially for the single-handed gardener. Fellows may obtain it post free, 1*s.* 2½*d.*, from the R.H.S. Office, Vincent Square, London, S.W.; or 2*s.* 2½*d.* if leather-bound.

7. THE SOCIETY'S GARDENS AT WISLEY.

Fellows who are not aware of the wonderful beauty of the Gardens, particularly at certain times of the year, may find the following calendar useful. Differences of season make it impossible to give more precise indications, but any Fellow who wishes to see any of the undermentioned plants at their best should send an enquiry to the Director accompanied by a stamped and addressed envelope.

January.—Early Narcissus, Galanthus, Leucojums, Crocus, Ericas, Hamamelis, Forsythias, Orchids, &c.

February.—Early Narcissus, Crocus, Ericas, Early Saxifrages, Daphnes, Helleborus, Orchids, &c.

March.—Early Narcissus, Crocus, Ericas, Early Rhododendrons, Alpines outside and under glass, Orchids.

April.—Primulas inside and outside, Narcissus, flowering trees and shrubs, Alpines outside and under glass, Orchids.

May.—Primula japonica, Tulips, Azaleas, Rhododendrons, Trees and shrubs, Alpines, Narcissus.

* The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to make up this sum ?

June.—Roses, Iris, Azaleas, Rhododendrons, trees and shrubs, Alpines and Pæonies, Nymphaeas.

July.—Roses, Iris Kaempferi, Phlox, Lilium giganteum, Kalmias, Delphiniums, &c.

August and September.—Roses, Phlox, rock plants, Herbaceous plants, Gentiana Asclepiadea, &c.

October, November, and December.—Autumn foliage, Michaelmas Daisies, Colchicums, &c.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*; or to and from Horsley or Byfleet, 7*s.* Motor cars will be found at Byfleet Station. Accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy, Ockham.

8. ROCK GARDEN AT WISLEY.

In response to the interest taken in what are popularly called "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that.

9. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

10. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London

are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

11. SPRING AND SUMMER SHOWS.

The Great Spring Show will be held at the Royal Hospital Gardens, Chelsea, on May 23, 24, and 25. The arrangements generally will be similar to those of past years.

The Summer Show will be held at Holland House, Kensington, on July 4, 5, and 6.

It must be borne in mind that any of the Meetings of the Society may possibly be over-ruled by the exigencies of the times, in which case as long a notice as possible will be given in the Press, but it will be impossible to notify each Fellow individually.

12. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations, which are held in June, are practical, viva voce, and written; the practical part being held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W.

13. INFORMATION.*

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungus attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

* *See* R.H.S. Gardeners' Diary, 1916, page 60. "How to send Specimens for Identification."

14. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3*s*. for one day (or £5 5*s*. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner*.

15. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.; no fewer than 300 Societies having joined our ranks.

Secretaries can obtain a specimen Card for the use of Affiliated Societies for Certificates, Commendations, &c. Price, including postage, 4*s*. for 10 copies, 6*s*. for 20, 12*s*. 6*d*. for 50, 21*s*. for 100. At the request of several of the Societies, the Council have had the Card coloured. The coloured Card is sold at 1*s*. a single copy, or 10 for 6*s*., post free.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s*. 9*d*., with case complete; Silver, 12*s*. 9*d*., with case complete; Silver-gilt, 16*s*. 9*d*., with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 9*d*. each.

16. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s*. 9*d*., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

17. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment Holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at threepence a copy, or fifty for 8*s*.

A companion Judges' Sheet in a very convenient book-like form can also be had for 2*s.* 6*d.* a dozen. This Judges' Sheet has, in tabulated form, a list of the subjects usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given.

18. R.H.S. DAFFODIL YEAR BOOK.

The Daffodil Year Books of the Society are amongst the most interesting works on gardening. The first issue (1913) was sold out within a month of publication. Double the quantity of the 1914 Year Book was printed, but of this only a few copies remain unsold. The 1915 Year Book has 144 pages (with 33 illustrations) of clear, reliable information, and it makes quite pleasant reading. These Year Books can be obtained from Messrs. Wesley, 28 Essex Street, Strand, London, W.C., price 3*s.* post free. The 1916 edition will be ready in August next.

19. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. The prices of each are as follows:—

Single Copy, 3*d.*; 25, 5*s.* 6*d.*; 50, 8*s.* 6*d.*; 100, 15*s.*:—

(1) A selected List of Hardy Fruits for all Gardens and of Small Fruits for Cottage and Allotment Gardens (1916 edition, considerably revised).
(2) The Training of Fruit Trees.
(3) Vegetables and How to Grow Them in Small Gardens and Allotments.
(4) Flowers for Small Gardens, Window Boxes, and Wall Decorations.
(5) Hardy and Half-Hardy Annuals in the Open Air.
(6) Bottling Fruits and Vegetables.
(7) Vegetable Cookery.
(8) Salads and Salad Making.
(9) The Growing of Vegetables from August-sown seeds.

20. TULIP REPORT.

The results of the exhaustive Trial of Tulips at Wisley will be issued shortly as a separate publication, at a charge of 2*s.* 6*d.* (3*s.* post free). This illustrated Report will constitute the standard

authority on Tulips for many years to come, and will contain lists of varieties useful for various purposes and arranged according to colours. Descriptions will be given of all the Tulips which were grown in the Trials at Wisley, illustrations of the various types of forms and colouring, lists of synonyms, references to the principal literature of the Tulip, &c. To be obtained from the Society's Publishers, Messrs. Wesley & Son, 28 Essex Street, Strand.

21. DOUGLAS JOURNAL.

At the request of the U.S.A. Department of Agriculture the Society has quite recently published the Diary, kept by David Douglas nearly 100 years ago, of his exploration of the wildest parts of North and North-Western America, whither the Society had sent him chiefly with a view to the introduction of new plants. It will be found to be vastly interesting, not only on account of the extraordinary number of the plants he discovered, but also on account of the topographical notes it contains and the evidence it affords of the condition of the country and of the Indians 100 years ago. It is published by Messrs. Wesley & Son, 28 Essex Street, Strand, London. Price £1 1s.

22. R.H.S. PUBLICATIONS.

In future, only Fellows can obtain the Society's publications from the R.H.S. Office, Vincent Square, S.W. Non-Fellows should order direct from Messrs. Wesley & Son, 28 Essex Street, Strand, W.C., who have been appointed Agents for the Society.

23. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

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